A REVIEW OF THE NEW WORLD SPECIES OF *EUPERILAMPUS* (HYMENOPTERA; CHALCIDOIDEA), WITH NOTES ABOUT HOST ASSOCIATIONS AND PHYLOGENETIC RELATIONSHIPS.

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Quaestiones Entomologicae
19: 1-40 1983

ABSTRACT

The genera Perilampus *Latreille,* Euperilampus *Walker,* Krombeinius *Bouček,* Steffanolampus *Peck, and* Monacon *Waterston form a monophyletic taxon ranked either as a family (Perilampidae), or as a subfamily (Perilampinae) of the Pteromalidae. Based on synapomorphic character states of size of postspiracular sclerite, pronotal size, and sculpture of inner orbits and propodeum,* Krombeinius *Bouček* and Euperilampus *Walker are sister groups, their common ancestor in turn being the derived sister group of the* Perilampus hyalinus *species group. The subgenera* Euperilampus sensu stricto (type species Perilampus gloriosus *Walker, 1862) and* Euperilampoides *Girault (type species* Euperilampoides scutellatus *Girault, 1915) are invalid taxa in a phylogenetic system, because character states hypothesized to be synapomorphic for them are more likely homoplasious. The 12 New World species of* Euperilampus *are arranged in three groups: the* E. tanyglossa *group;* E. krombeini *Burks; and the* E. triangularis *group. The* E. tanyglossa *group includes two Mexican species,* E. tanyglossa *new species (type locality-- Jalisco, Zapotlanejo), and* E. aureicornis, *new species (type locality-- Guerrero, Amula). The sister group of these species is hypothesized to be the Old World species* E. mediterraneus *Bouček,* and to be related to E. scutellatus *Girault, 1915, another Palearctic species. The* E. tanyglossa *group* + E. mediterraneus + E. scutellatus, *based on synapomorphic features of notauli and mesoscutal sculpture, comprise the sister group of the stem of* E. krombeini + *the* E. triangularis *group. The latter is based on synapomorphic features of postspiracular sclerite, propodeal and mesoscutal sculpture, and color of body and wings, and includes nine New World species, of which four are in the* E. brasiliensis *complex, and the others are not further classified. Members of the* E. brasiliensis *complex are:* E. brasiliensis *(Ashmead);* E. enigma, *new species (type locality-- Bolivia, Santa Cruz, Roborê);* E. ameca, *new species (type locality-- Mêxico, Nayarit, Santa Isabel); and* E. luteicrus *(type locality-- Mêxico, Jalisco, Guadalajara). The unclassified species of the* E. triangularis *group are* E. triangularis *(Say);* E. gloriosus *(Walker);* E. magnus, *new species (type locality-- Mêxico, Chiapas, El Chorreadero);* E. solox, *new species (type locality-- Argentina, Tucuman, Tacanas); and* E. iodes, *new species (type locality-- Brazil, Santa Catarina, Nova Teutonia). Because of a shortage of reliably interpretable characters, a reconstructed phylogeny of the species of the* E. triangularis *group is not proposed.* Euperilampus triangularis *is a parasitoid of the ichneumonid,* Hyposoter fugitivus *Say, itself a parasitoid of the arctiid,* Hyphantria cunea *(Drury).*

RÉSUMÉ

Les genres Perilampus *Latreille,* Euperilampus *Walker,* Krombeinius *Bouček,* Burksilampus *Bouček,* Steffanolampus *Peck, et* Monacon *Waterston constituent une lignée monophylétique classifiée soit comme famille (Perilampidae), ou comme une sous-famille (Perilampinae) des Pteromalidae. En considérant les conditions synapomorpiques de la taille du sclérite postspiraculaire et du pronotum, et de la sculpture de la région intraorbitale et du propodéum,* Krombeinius; *Bouček* et Euperilampus *Walker représentent des taxons frères, dont l'ancêtre commun est à son tour le taxon dérivé et frère du groupe d'espèces de* Perilampus hyalinus. Les sous-genres Euperilampus sensu stricto *(espèce type:*Perilampus gloriosus *Walker, 1862) et* Euperilampoides *Girault (espèce type:* Euperilampoides scutellatus *Girault, 1915) sont des taxons invalides dans le cadre d'une classification phylogénétique, parce que les conditions des caractères supposément synapomorphiques regroupant les deux sont probablement issues de convergence. Les 12 espèces d'*Euperilampus *du Nouveau Monde sont arrangées en trois groupes: le groupe d'*E. tanyglossa*;* E. krombeini *Burks; et le groupe d'*E. triangularis. *Le groupe d'*E. tanyglossa *comprend deux espèces mexicaines:* E. tanyglossa, *nouvelle espèce (localité du type: Jalisco, Zapotlanejo), et* E. aureicornis, *nouvelle espèce (localité du type: Guerrero, Amula). Le taxon frère de ces espèces est supposé être* E. mediterraneus *Bouček,* de l'Ancien Monde, et serait lui-même apparenté à E. scutellatus *Girault, 1915, une autre espèce eurasienne. Basé sur les particularités synapomorphiques des notauli et de la sculpture du mésoscutum, le groupe d'*E. tanyglossa *forme, avec les espèces* E. mediterraneus *et* E. scutellatus, *le taxon frère d'*E. krombeini *et du groupe d'*E. triangularis. *Ce dernier est défini à partir de caractéristiques synapomorphiques du sclérite postspiraculaire, de la sculpture du propodéum et du mésoscutum, et de la couleur du corps et des ailes; il comprend neuf espèces du Nouveau Monde, parmi lesquelles quatre font partie du complexe d'*E. brasiliensis, *tandis que les autres ne sont pas classifiées. Les membres du complexe d'*E. brasiliensis *sont:* E. brasiliensis *(Ashmead);* E. enigma, *nouvelle espèce (localité du type: Bolivie, Santa Cruz, Roboré);* E. ameca, *nouvelle espèce (localité du type: Mexique, Nayarit, Santa Isabel); et* E. luteicrus, *nouvelle espèce (localité du type: Mexique, Jalisco, Guadalajara). Les espèces non classifiées du groupe d'*E. triangularis *sont:* E. triangularis *(Say);* E. gloriosus *(Walker);* E. magnus, *nouvelle espèce (localité du type: Mexique, Chiapas, El Chorreadero);* E. solox, *nouvelle espèce (localité du type: Argentine, Tucuman, Tacanas); et* E. iodes, *nouvelle espèce (localité du type: Brêsil, Santa Catarina, Nova Teutonia). L'auteur ne présente pas de diagramme phylogénétique pour les espèces du groupe d'*E. triangularis *à cause d'un manque de caractères interprétables de façon sûre.* Euperilampus triangularis *est un parasitoïde d'*Hyposoter fugitivus *Say, un Ichneumonidae lui-même parasitoïde de l'Arctiidae* Hyphantria cunea *(Drury).*

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INTRODUCTION

The genera *Perilampus* Latreille, *Euperilampus* Walker, *Krombeinius* Bouček, *Burksilampus* Bouček, *Steffanolampus* Peck and *Monacon* Waterston form a well defined monophyletic taxon regarded as either the family Perilampidae (Graham 1969) or as a subfamily in the Pteromalidae, the Perilampinae (sensu Bouček 1978). Bouček (1978) has characterized this taxon and reviewed the arguments concerning the placement of this group in the higher classification of the Chalcidoidea. No resolution will be possible until phylogenetic studies are conducted in the Chalcidoidea. The Pteromalidae is most certainly a paraphyletic group (possible polyphyletic), and relegating *Perilampus* and related genera to this unnatural assemblage is unwarranted phylogenetically and practically. I therefore follow Graham (1969)

and recognize the family Perilampidae. I exclude Chrysolampinae (sensu Graham 1969) from this family, again following Graham (1969). Larval structures of *Chrysolampus thenae* (Walker) were discussed by Askew (1980), and offer no basis for inclusion of this genus in a higher taxon with the genus *Perilampus*. Where known, all species of *Perilampus* have a planidial first instar larva (Smith 1912, Clancy 1946, Principi 1947). This type of larva is not found in *Chrysolampus*. The larval characters cited by Askew (1980) as indicating a close relationship between *Perilampus* and *Chrysolampus* are widely distributed in many chalcidoid taxa (see Parker 1924) and are here regarded as plesiomorphies.

Revisions are currently available for all genera of Perilampidae except the large cosmopolitan genus *Perilampus* (Bouček 1980, for *Monacon*; Bouček 1978, all other genera). In assembling material for a revisionary study of New World *Perilampus* I have received undescribed species of *Euperilampus* from México and South America that provide important insights into the phylogeny and biogeography of *Euperilampus*.

In this paper I discuss generic characters of *Euperilampus*, examine the validity of the current subgeneric classification, and review and present a key to the New World species. Eight new species are described, and all New World species except *E. gloriosus* are redescribed. The host associations of *E. triangularis* are also discussed. A cladogram of species groups of *Euperilampus* is presented, and the phylogenetic relationships of *Krombeinius*, *Euperilampus* and *Perilampus* are discussed.

SYNOPSIS OF THE NEW WORLD SPECIES OF *EUPERILAMPUS*

E. tanyglossa species group
- *E. tanyglossa* n. sp.
- *E. aureicornis* n. sp.

E. krombeini Burks

E. triangularis species group
- *E. triangularis* (Say)
- *E. gloriosus* (Walker)
- *E. magnus* n. sp.
- *E. solox* n. sp.
- *E. iodes* n. sp.
- *E. brasiliensis* complex
  - *E. brasiliensis* (Ashmead) n. comb.
  - *E. enigma* n. sp.
  - *E. luteicrus* n. sp.
  - *E. ameca* n. sp.

METHODS AND TERMS

Color.— All New World species of *Euperilampus* exhibit metallic or iridescent colors that are difficult to describe. These structural colors are the result of interference patterns, due to asynchrony between the component wavelengths of entering and returning light. The predominant color depends primarily on thickness of alternating cuticular lamellae and distance between successive lamellae and, to a lesser degree, on angle of incidence of incoming light. A change in angle of incidence from 60 degrees to 90 degrees can result in a 40 nm color

shift. This can result in changes in color from violet to blue-violet or from blue to blue-green (Fox 1979). Metallic colors can therefore only be described in general terms. I use spectral colors, i.e., violet is preferred to purple, purple being a pigmentary color resulting from a mixture of reds and blues. In this paper all colors were described when viewed under diffuse incandescent light.

Care must also be taken in describing metallic colors of specimens subjected to certain taxonomic procedures. For instance, lacto-phenol (a clearing agent) and thymol (an anti-fungicide used in relaxing jars) are swelling agents which cause a change to longer reflected wavelengths, and color changes from blue to green, or to brassy-yellow. These changes are thought to be reversible (Fox 1979), but specimens treated with lacto-phenol retain the aberrant colors months after removal from the swelling agent.

Structure and Sculpture.— Morphological terms follow Graham (1969) and Richards (1977). Hence, 'postspiracular sclerite' is used for 'prepectus' of authors in the Chalcidoidea. Sculpture types follow Eady (1968), except 'coriarious' is used in preference to 'coriaceous', following the recommendation of Harris (1979, p. 2). Sculpture is best viewed and is here described under diffuse light. Scanning electron micrographs illustrate the major types of sculpture.

The antennae of *Euperilampus* are sexually dimorphic. The funicle is stouter and the scape is expanded distally in males. In some species of *Euperilampus* the anterior face of the male scape is roughened (100-200X magnification), and scanning electron microscopy reveals indentations with pores (Figs. 45-52). Similar sexual characters are found in *Perilampus* and *Steffanolampus*. In males of *Perilampus hyalinus* (Say) (Fig. 64), the anterior surface of the scape is covered with large punctures each of which has a single central pore. In *Perilampus* these structures have been referred to as 'sensorial punctures' (Smulyan 1936). It seems more likely that the pores are glandular openings and not sensory in function; there is no indication of a cuticular peg or dome. Note that many of the punctures are filled with material (Fig. 64). Possibly this substance is the residue of pheromones involved in sexual behavior. Histological studies will be necessary to adequately characterize these structures. I use the term 'punctures' for these structures. In *Euperilampus* there are two to six pores in each puncture (Figs. 46,48,52) or punctures are absent (Figs. 42-44). Determination of taxonomic importance of number of pores per puncture must await collection of more material. The distribution of punctures, however, has proved of considerable value in delimiting species.

Measurements.— The terms length (L), width (W), and height (H), refer to the maximum value obtained by rotating the specimen. This avoids parallax problems encountered when measuring three-dimensional objects. It is, however, critical to have both endpoints in focus when the measurements are taken. Measurements and their abbreviations used in the text are as follows: EH, eye height, taken in frontal view; MS, length of malar space; A, length of anellus in dorsal view; F1, length of first funicular segment in dorsal view; SL, scape length; SW, scape width; HW, head width, in frontal view; HL, head length, in frontal view, from vertex to lower margin of clypeus; CH, clypeus height; SH, height of supraclypeal area; SW, width of scrobes; OOL, length of ocular-ocellar line; POL, postocellar line, distance between posterior ocelli; PN, length of pronotum along midline; MSC, length of mesoscutum along midline; and SC, length of scutellum along the midline.

MATERIAL

This study is based on a total of 603 adults of *Euperilampus*, as well as representative material of related taxa. Specimens included are housed in the following collections, which are indicated in the text by the associated acronyms.

AEI: American Entomological Institute, Ann Arbor, MI, U.S.A. 48105 (H.K. Townes)
BMNH: British Museum (Natural History), London, England SW7 5BD (J.S. Noyes)
CAS: California Academy of Sciences, San Francisco, CA, U.S.A. 94118 (P.H. Arnaud, Jr.)
CNC: Canadian National Collection, Ottawa, Canada K1A 0C6 (C. Yoshimoto)
CU: Cornell University, Ithaca, NY, U.S.A. 14853 (L.L. Pechuman)
DCD: D. Christopher Darling, personal collection
FSCA: Florida State Collection of Arthropods, Gainesville, FL, U.S.A. 32611 (L. Stange)
IESM: Instituto Entomologico San Miguel 1663, San Miguel, Argentina (M.A. Fritz)
IML: Instituto Miguel Lillo, Universidad Nacional de Tucuman, Tucuman, Argentina (P. Fidalgo)
KSU: Kansas State University, Manhattan, KS, U.S.A. 66506 (H.D. Blocker)
NHMLAC: Natural History Museum, Los Angeles County, Los Angeles, CA, U.S.A. 90007 (R.R. Snelling)
UA: University of Arkansas, Fayetteville, AK, U.S.A. 72701 (R.G. Chenowith)
UG: University of Guelph, Guelph, Canada N1G 2W1 (D. Pengelly)
UK: Snow Entomological Museum, University of Kansas, Lawrence, KS, U.S.A. 66045 (C.D. Michener)
UNLP: Universidad Nacional de La Plata, 1900 La Plata, Argentina (L. de Santis)
USNM: United States National Museum, Washington, DC, U.S.A. 20560 (E.E. Grissell)
USU: Utah State University, Logan, UT, U.S.A. 84322 (W.J. Hanson)

Other repositories for specimens of *Euperilampus* are as follows: American Museum of Natural History, New York, NY 10024 (M. Favreau); Academy of Natural Sciences of Philadelphia, Philadelphia, PA 19103 (D. Otte); Carnegie Museum of Natural History, Pittsburgh, PA 15213 (G. Ekis); Colorado State University, Fort Collins, CO 80521 (H. E. Evans); Illinois Natural History Survey, Urbana, IL 61803 (W. La Berge); Museum of Comparative Zoology, Harvard University, Cambridge MA 02138 (A. Newton, Jr.); Ohio State University, Columbus, OH 43210 (C. Triplehorn); Pennsylvania State University, University Park, PA 16802 (K. Kim); Southwestern Research Station, Portal, AZ 85632 (V.D. Roth); S.U.N.Y., Syracuse, Syracuse, NY 13210 (M. O'Brien); Texas A & M University, College Station, TX 77843 (S. Merritt); University of Alberta, Edmonton, Canada T6G 2E3 (G.E. Ball); University of Arizona, Tucson, AZ 85721 (F.G. Werner); University of Georgia, Athens, GA 30602 (C. Smith); University of Michigan, Ann Arbor, MI 48109 (T. Moore); and University of Minnesota, St. Paul, MN 55108 (P. Clausen).

I thank all who allowed me to study the material under their care. The curators of the Snow Entomological Museum (UK) and Utah State University Collection (USU) were particularly generous in allowing holotypes described from their material to be deposited in the Smithsonian Collection (USNM). This was requested to allow amalgamation of type material to facilitate further study of the group. The result is that six of the ten extant primary types are at the USNM, with single holotypes in BMNH, CAS, CNC, and IML.

GENUS *EUPERILAMPUS*

Euperilampus Walker, 1871: 67. Type Species: *Perilampus gloriosus* Walker, 1862: 375, by monotypy and original designation.

Euperilampus (*Euperilampus*): Bouček 1972:90 [as subgenus].

Euperilampoides Girault, 1915: 308. Type Species: *Euperilampoides scutellatus* Girault, 1915, by monotypy and original designation [synonymy by Riek, 1966: 1227].

Euperilampus (*Euperilampoides*); Bouček 1972:90 [as subgenus].

Nesoperilampus Rohwer, 1923: 349. Type species: *Nesoperilampus typicus* Rohwer 1923, by monotypy and original designation [synonymy by Riek, 1966: 1227].

Diagnosis.— *Euperilampus* is reliably distinguished from other perilampid genera by having the postspiracular sclerite a narrow triangle (Figs. 35-37), much less than half as wide as the adjacent pronotal collar, and by having the marginal vein distinctly shorter than the postmarginal vein (Figs. 57-59). *Perilampus* (Figs, 60, 61), *Steffanolampus*, *Burksilampus*, and *Monacon* have the postspiracular sclerite at least as wide as the adjacent pronotal collar. All genera except *Euperilampus* have the marginal vein longer than the postmarginal vein (Fig. 62).

The genus *Euperilampus* has been characterized by Riek (1966), Burks (1969) and Bouček (1978). Bouček (1978) has presented a key to world species. Two subgenera were recognized, following Bouček (1972, 1978): *Euperilampus sensu stricto*, bright metallic species with midlobe of mesoscutum and entire scutellum with coarse cross-arcuate rugae, New World; and *Euperilampoides* Girault, dark metallic to black species with thoracic dorsum generally punctate-reticulate, Old World.

Character states of two new species described in this paper (*E. tanyglossa* and *E. aureicornis*) refute this classification. These New World species have the punctate-reticulate sculpture and slightly indicated notauli of the Old World subgenus *Euperilampoides* but are metallic blue-green in color rather than black. Hence, these species are contradictory at the first couplet of Bouček's (1978) key, where the subgenera of *Euperilampus* are separated. As will be discussed, *E. tanyglossa* and *E. aureicornis* are more closely related to *Euperilampus (Euperilampoides) mediterraneus* than to other New World species. Phylogenetic relationships within the genus, discussed in detail at the end of the paper, are not consistent with recognition of New World and Old World subgenera, *Euperilampus* and *Euperilampoides* (SYNONYMY, REVISED STATUS).

Comparative morphological studies of the Perilampidae have revealed that male genitalia and structure of the labrum (both sexes) characterize *Euperilampus*.

Figures 1 and 2 illustrate major features of the male genitalia. All New World species with the exceptions of *E. gloriosus*, *E. aureicornis*, *E. magnus* (male unknown), and *E. ameca* (male unknown) and the Old World species *E. scutellatus* were examined and allow the following characterization: distinct parameres lacking, basiparamere (Bp) with a patch of strong setae (Ls) distributed on transparent areas (Ld) laterad of ventral lobe (Vl). In *Perilampus* (Domenichini 1953), *Steffanolampus* and *Krombeinius* (Darling, unpublished) the parameres are well developed, with the strong setae distributed on these lobes. The presence of distinct parameres is here regarded as the plesiomorphic state for the Chalcidoidea, because this state is widely distributed in many taxa (see Domenichini 1953).

Figure 3 illustrates form of the highly distinctive labrum of *Euperilampus* adults. *Euperilampus triangularis*, *E. krombeini*, *E. scutellatus* (males and females), and *E. tanyglossa* (male) were examined and allow the following characterization: 8-digitate with a deep median incision, each digitus with a strong terminal seta, and with a pair of smaller,

sessile setae located below the level of the digiti. This arrangement differs from that of *Perilampus* (Riek 1966, Domenichini 1969) and *Steffanolampus salicetum* (Darling, unpublished): 10 or 12-digitate, with one digit arising more toward the base of the structure, and the labrum not deeply excised medially, and *Krombeinius eumenidarum* (Darling, unpublished): a single narrow central stalk, with the seven digiti arising apically.

New World species of *Euperilampus* are metallic in color and are distributed from eastern Canada to southern Brazil.

KEY TO NEW WORLD *EUPERILAMPUS*

1 Entire mesoscutum and scutellum punctate-reticulate (similar in sculpture to the pronotum), notauli indistinctly indicated (Fig. 33); labio-maxillary complex elongate, protruded far beyond the closed mandibles (Fig. 4) 2

1′ Midlobe of mesoscutum and scutellum with transverse rugae or costae, notauli distinct (Fig. 14); labio-maxillary complex not conspicuously protruded beyond closed mandibles (Fig. 9) 3

2 (1) Postspiracular sclerite with three or four weak foveae (Fig. 35); frontal carina weakly divergent and following inner eye margin, inner orbits not markedly narrowed at level of antennal toruli (Fig. 5) [Female funicle dark brown, male funicle yellow] ..... *E. tanyglossa* n. sp., p. 8

2′ (1) Postspiracular sclerite with a single weak fovea, below fovea with coriarious sculpture; frontal carina oblique, convergent towards inner eye margin, inner orbits markedly narrowed at level of antennal toruli (Fig. 6) [Female and male funicle yellow] ..... *E. aureicornis* n. sp., p. 10

3 (1′) Apex of scutellum broadly rounded (Fig. 12); lateral wall of scrobes merged smoothly with face (not angulate in lateral view), the inner orbits without well developed longitudinal costae or rugae (Fig. 8) ..... *E. krombeini* Burks, p. 11

3′ (1′) Apex of scutellum acuminate (Figs. 13-16); lateral wall of scrobes merged abruptly with face at level of antennal toruli (angulate in lateral view), inner orbits with well developed longitudinal costae or rugae (Fig. 9) ..... (*E. triangularis* species group) 4

4 (3′) Scutellum abruptly produced into lanceolate spine, much longer than wide (see Bouček 1978, Fig. 9); metasoma and apex of scutellum bright coppery to golden in color ..... *E. gloriosus* (Walker), p. 15

4′ (3′) Scutellum without abrupt lanceolate spine; entire scutellum and metasoma metallic violet, blues and greens, in some specimens with black areas, not coppery in color 5

5 (4′) Mesoscutum with distinct contrasting glossy black areas on sidelobe, along notauli, black areas smooth, not roughened (Fig. 14) 6

5′ (4′) Mesoscutum without distinct contrasting black areas on sidelobe along notauli; areas along notauli roughened in many specimens 9

6 (5) Fore and mid tibiae yellow, concolorous with tarsi; male antennal scape with distinct punctures on anterior surface, surface roughened (Fig. 45) [Mexican, Female unknown] ..... *E. luteicrus* n. sp., p. 21

6′ (5) Fore and mid tibiae dark, brown or metallic; male antennal scape with punctures fewer and distinctly separated (Fig. 49,50) 7

7 (6′) Females [antennal scape not widened apically, Figs. 5-7] ..... *E. brasiliensis* complex

7′ (6′) Males [antennal scape widened apically, Figs. 42,45] 8

8 (7′) Scape without distinct punctures on anterior surface (Fig. 49), surface smooth; digiti of genitalia without large recurved teeth (Fig. 75) ..... *E. brasiliensis* (Ashmead), p. 19

8′ (7′) Scape with distinct punctures on anterior surface (Fig. 50), surface roughened; digiti of genitalia with large, recurved teeth (Fig. 74) ..... *E. enigma* n. sp., p. 20

9 (5′) Axillula with distinct costae, ventral costa merged with posterior margin of axillula (Fig. 53); sculpture on scutellum reduced medially, rugae incomplete (Fig. 16) ..... *E. triangularis* (Say), p. 13

9′ (5′) Axillula smooth or with indistinctly defined costae, not merged with posterior margin of axillula (Fig. 54); sculpture on scutellum not reduced medially, rugae or costae complete (Fig. 13, 15) 10

10 (9′) Midlobe of mesoscutum with regular cross-arcuate costae (Figs. 13,14) 11

10′ (9′) Midlobe of mesoscutum with irregular rugae (Fig. 15) 12

11 (10) Margin of scrobes, sinuous in frontal view, markedly flared at level of antennal toruli (as in Fig. 11); postspiracular sclerite with large centrally located fovea co-extensive with most of upper postspiracular sclerite; sidelobe of mesoscutum with narrow black areas along notauli ..... *E. ameca* n. sp., p.21

11′ (10) Margin of scrobes, smoothly curved in frontal view, not markedly flared at level of antennal toruli (Fig. 10); postspiracular sclerite with small fovea located anteriorly, leaving large, smooth triangular area posteriorly (Fig. 31); sidelobe of mesoscutum without black areas along notauli ..... *E. iodes* n. sp., p. 17

12 (10′) Postspiracular sclerite with distinctly circular fovea, not co-extensive with entire upper postspiracular sclerite (as in Fig. 37), smaller puncture below; scutellum relatively short, SC:MSC = 1.24; margin of scrobes not flared at level of antennal toruli (Fig. 7); large, about 7 mm ..... *E. magnus* n. sp., p. 16

12′ (10′) Postspiracular sclerite with large fovea co-extensive with entire upper postspiracular sclerite (Fig. 32); scutellum longer SC:MSC = 1.34-1.50; margin of scrobes flared at level of antennal toruli (as in Fig. 11); smaller, maximum length 6 mm ..... *E. solox* n. sp., p. 16

THE NEW WORLD SPECIES OF *EUPERILAMPUS*

Euperilampus tanyglossa n. sp.
(Figs. 4, 5, 18, 25, 28, 33, 34, 35, 41, 42, 56, 58, 69, 70)

Type Locality.— México, Jalisco, Zapotlanejo.

Type Material.— Holotype (Female, USNM No. 100317): México, Jalisco, Zapotlanejo (Oct. 3 1966, G.E./A.S. Bohart) [Specimen donated to USNM by USU]. Paratypes: Female, four Males, all from México: Morelos, 10 mi E Cuernavaca, (Sept. 15 1972, Hanson/Poff) [Female, USU]; Zacatecas, 5 mi N Tabasco, (Sept. 18 1970; G.E./R.M. Bohart) [2 males: USNM, BMNH]; Jalisco, 15 mi NE Guadalajara, (Sept. 17 1970, G.E./R.M. Bohart) [Male, USU]; Morelos, 6 mi E Cuernavaca, (Sept. 1 1970, Bohart/Hanson) [Male, DCD].

Diagnosis.— Combination of an elongate labio-maxillary complex (Fig. 4) and postspiracular sclerite with three or four indistinct foveae (Fig. 35) distinguish this species from

all New World species. *E. aureicornis*, which also has an elongate labio-maxillary complex, has a single, indistinct fovea on the upper postspiracular sclerite and the funicle and clava of the antenna yellow in both sexes (*E. tanyglossa*: female, dark brown; male, bright orange-yellow). *E. tanyglossa* is distinguished from *E. krombeini* and *E. triangularis* group species by the elongate labio-maxillary complex and the punctate-reticulate sculpture of the mesoscutum (Fig. 33; cf. Fig. 12, *E. krombeini* and Fig. 16, *E. triangularis*).

Geographical distribution.— This species is distributed in the Central Plateau region of México. The six specimens were collected in five localities and in three different years. All specimens have been collected between 1 September and 3 October. It is likely that this species is widely distributed in the highlands of central México but is rarely collected because adults are present for only about one month of the year. A similar seasonal abundance pattern is found in *E. krombeini*. The host is unknown. The elongate labio-maxillary complex suggests associations with long-corolla flowers.

Derivation of specific epithet.— From the Greek (*tany*, 'long' and *glossa*, 'tongue'), a reference to the extremely elongate labio-maxillary complex.

Description.—

Female: Length, 4.8-5.8 mm. Head dark metallic green and violet; antennal scape metallic green, pedicel and anellus brown, funicle and clava dark brown above, underside with light brown areas; labio-maxillary complex dark brown; mandible reddish in middle, dark at base and apex. Mesosoma metallic green and violet; wings strongly darkened throughout; coxae, trochanters and femora dark violet, tibiae dark brown without metallic reflections, tarsi yellow, pretarsi dark brown. Metasoma metallic green.

Head: length of malar space 0.25-0.28 eye height; OOL 0.96-1.0 POL; frontal carina narrowly divergent, parallel with inner eye margin, inner orbits not markedly narrowed at level of antennal toruli (Fig. 5); maximum width of scrobes about one-third (0.33-0.35) head width; head transverse, width:height = 1.24-1.28; gena well developed, head widest across genae; vertical costae of inner orbits (parascrobal spaces) short and irregular, surface thus wrinkled, extended onto face and convergent with well developed orbital costae on clypeus as less distinct cross-arcuate costae; clypeus with well developed transverse costae; clypeus transverse, width:height = 1.65-1.74, with sparse short setae except for patch of setae (seven to nine) at each lateral ventral margin, upper margin straight, lower margin emarginate, without tentorial pits; ocular-ocellar region and vertex costate; ocellar triangle almost smooth; supraclypeal area 0.59-0.60 clypeus height, polished with two parallel lines from upper margin of clypeus to antennal toruli; margin of scrobes, in lateral view, merged smoothly with face (Fig. 4); lower tooth of mandible rounded at apex; labio-maxillary complex extremely elongate (Figs. 4, 56). Antennae: pedicel and funicular segments subequal in length; funicular segments transverse, except elongate F1; anellus 0.40 length of F1; scape narrowly linear, length 4.4-5.1 maximum width.

Mesosoma: PN:MSC = 0.33-0.36; SC:MSC = 1.13-1.18; dorsum of pronotum and entire mesoscutum punctate-reticulate (Fig. 33), punctures well defined, distinctly circular (Fig. 25) and coalesced in from of transverse rugae only anteriorly on pronotum and along meson of mesoscutum; notauli indistinct; scutellum with short irregular transverse rugae medially, punctate-reticulate laterally; apex of scutellum with distinct and indistinctly septate marginal rim (Fig. 34); sides of scutellum rounded, convergent at an angle of about 70 degrees; underside of scutellum smooth; propodeum vertical, with wide but indistinctly impressed median area, submedian areas coriarious with transverse costae, callus reticulate-rugose (Fig. 18); postspiracular sclerite gradually narrowed ventrally (Fig. 35), not sinuous as in *E. triangularis* group, with three or four indistinct foveae; pronotum with smooth area laterally, below level of foveae on postspiracular sclerite; axilla punctate-reticulate above, below with irregular costae; axillula with well developed longitudinal rugae. Forewing: stigmal vein equal to or slightly longer than marginal vein, postmarginal about 3 times length of marginal vein (Fig. 58).

Metasoma: smooth and shining without punctures; setae sparse; T2 with abrupt median concavity and Y-shaped groove (Fig. 28), border between T2 and T3 sinuous and indistinct; T3 more quadrate than in *E. triangularis* group, length about one-half maximum width.

Male: Length, 5.2-6.5 mm. Color as in female; except funicle and clava bright orange-yellow and underside of funicle with dark transverse markings. Structure and sculpture as in female except; Head: length of malar space, 0.16-0.22 eye height; head width:height = 1.20-1.24; clypeus width:height = 1.68-1.78; lateral wall of scrobes slightly more developed; antennal scape, in frontal view, expanded only slightly, length 3.5-4.0 maximum width, without distinct punctures (Fig. 42), in lateral view expanded apically with strong setae on outer surface, punctures well developed, surface distinctly roughened (Fig. 41), inner surface with indistinct punctures; pedicel quadrate; funicle stouter. Mesosoma: PN:MSC = 0.34-0.37; SC:MCS = 1.10-1.21. Metasoma: T3 more transverse. Subgenital plate (Fig. 69): elongate, sides gradually divergent, widest along sternite 8, width 1.43-1.50 length along midline [n=2]. Genitalia (Fig. 70); digiti with four or five large teeth and single smaller tooth; ventral lobe triangular, apex broadly rounded; lateral demelanized areas of basiparamere large, pigmented median area much longer than length of digiti [n=2].

Euperilampus aureicornis n. sp.
(Fig. 6)

Type Locality.— México, Guerrero, Amula [Almolonga on recent maps].

Type Material.— Holotype (Female, BMNH). México, Guerrero, Amula 6000 ft., (Sept., H. H. Smith). Godman-Salvin Coll. 1904.-1. Paratype: Male, same label data as holotype [BMNH].

Diagnosis.— Combination of elongate labio-maxillary complex (as in Fig. 4) and postspiracular sclerite with a single fovea distinguish this species from all other New World species. *E. aureicornis* is very similar to *E. tanyglossa* which also has the elongate labio-maxillary complex, but differs in having only a single fovea on the postspiracular sclerite (cf. three or four in *E. tanyglossa*) and funicle and clava of the antennae yellow in the female (cf. brown in *E. tanyglossa*). *E. aureicornis* is distinguished from *E. krombeini and E. triangularis* group species by the elongate labio-maxillary complex and the punctate-reticulate sculpture of the mesoscutum (as in Fig. 33; cf. Fig. 12, *E. krombeini* and Fig. 16, *E. triangularis*).

Geographical distribution.— This species is known from a single locality at 1829 m. in the Sierra Madre del Sur. The host is unknown.

Derivation of specific epithet.— From the Latin (*aureus*, 'golden' and *cornus*, 'horn') referring to the yellow antennae (funicle and clava) in both males and females.

Description.—

Female: Length, 4.1 mm. Head metallic green, scrobal cavity black; antennal scape metallic green, pedicel dark brown, anellus, funicle and clava golden yellow; labio-maxillary complex dark brown; mandible yellow-brown in middle, dark at base and apex. Mesosoma metallic green with violet reflections on pleurae; wings darkened throughout; coxae with metallic violet reflections, femora, trochanters and tibiae deep brown, tarsi brown. Metasoma dark metallic green, with bronzy reflections.

Head: length of malar space 0.23 eye height; OOL equal to POL; frontal carina oblique, convergent toward inner eye margin, inner orbits markedly narrowed at level of antennal toruli (Fig. 6); maximum width of scrobes about one-half (0.46) head width; head transverse, width:height = 1.30; gena well developed, head widest across genae; vertical costae of inner orbits short and irregular, surface wrinkled, extended onto face and convergent with well developed outer orbital costae at clypeus as less developed cross-arcuate costae; clypeus transverse, width:height = 1.54, evenly covered with sparse short setae, smooth and shining with indistinct punctures, transverse costae only at extreme lateral margins, with indistinct tentorial pits at about midpoint of lateral margins of clypeus (Fig. 6); ocular-ocellar region and vertex costate; ocellar triangle almost smooth; supraclypeal area 0.62 clypeus height; margin of scrobes, in lateral view, merged smoothly with face (as in *E. tanyglossa*, Fig. 4); lower tooth of mandible tapered to sharp point; labio-maxillary complex extremely elongate (as in *E. tanyglossa*, Fig. 4); Antennae: pedicel and funicular segments subequal in length; funicular segments transverse except elongate F1; anellus 0.38 length of F1; scape narrowly linear, length 4.8 maximum width.

Mesosoma: PN:MSC = 0.36; SC:MSC = 1.11; dorsum of pronotum and entire mesoscutum punctate-reticulate, punctures coalesced in form of transverse rugae only anteriorly on pronotum and along meson of mesoscutum (as in *E. tanyglossa*, Fig. 33); notauli indistinct; scutellum with short irregular transverse rugae medially, punctate-reticulate laterally; apex of scutellum with distinct and weakly septate marginal rim; sides of scutellum rounded, convergent at angle of about 70 degrees; underside of scutellum smooth; propodeum vertical, with shallowly impressed median area, with indistinct transverse costae, raised submedian areas coriarious with transverse costae more dense than in *E. tanyglossa* (cf. Fig. 18), callus reticulate-rugose; postspiracular sclerite gradually narrowed ventrally (as in *E. tanyglossa*, Fig. 35), with single large fovea, and coriarious sculpture below fovea; pronotum with coriarious area laterally, below level of fovea on postspiracular sclerite; axilla punctate-reticulate above, below with irregular rugae; axillula with well developed oblique rugae, similar to *E. triangularis* (cf. Fig. 53). Forewing: stigmal vein slightly longer than marginal, postmarginal about three times length of marginal vein (as in *E. tanyglossa*, Fig. 58).

Metasoma: smooth and shining without punctures; setae sparse; T2 with abrupt median concavity, border between T2 and T3 sinuous and indistinct; T3 more transverse than in *E. tanyglossa* length about one-third maximum width.

Male: Length, 3.75 mm. Color as in female. Structure and sculpture as in female except; Head: length of malar space, 0.20 eye height; head width:height = 1.35; clypeus width:height = 1.49, tentorial pits much deeper and larger; antennal scape, in frontal view, expanded only slightly, length 4.15 maximum width, without distinct punctures, in lateral view expanded apically with strong setae on lateral suface but without well developed punctures, surface smoother than in *E. tanyglossa* (cf. Fig. 42), inner surface of scape with punctures more distinct and larger than in *E. tanyglossa*; pedicel quadrate. Mesosoma: PN:MSC = 0.36; SC:MSC = 1.11. Genitalia and subgenital plate not examined.

Euperilampus krombeini Burks
(Figs. 8, 12, 17, 29, 36, 38, 43, 59, 68, 73)

Euperilampus krombeini Burks, 1969: 79, (Figs. 6,9).

Type Locality.— U.S.A., Arizona, Tucson.

Type Material.— Holotype (female, USNM No. 69937) [examined]. Paratypes, 3 Females, 6 Males (USNM) [examined; Allotype, USNM No. 69937, misidentified as male; Male paratype deposited in UK].

Material Examined.— U.S.A. (39 Females, 28 Males): Arizona (Cochise, Pima Cos.), New Mexico (Hildago Co.). México (6 Females, 2 Males): Sonora, Sinaloa, Chihuahua, Baja California Sur.

Diagnosis.— This is the only New World species of *Euperilampus* that lacks well developed longitudinal costae or rugae on the inner orbits (parascrobal spaces) (Fig. 8). This species is distinguished from species of the *E. triangularis* group by the lateral walls of the scrobe, which merge smoothly with the face (Fig. 8; cf. Fig. 9, *E. triangularis*), and from *E. tanyglossa* and *E. aureicornis* by the short labio-maxillary complex and the cross-arcuate sculpture of the midlobe of the mesoscutum (Fig. 12; cf. Fig. 33, *E. tanyglossa*).

Geographical distribution.— This species has been collected primarily in the Sonoran and Chihuahuan desert regions. All specimens have been collected in August and September. The host is unknown and many specimens have been collected on flowers.

Description.— *E. krombeini* is redescribed primarily to allow comparison with other species, and to include characters not in the original description. Bouček (1978) figured the apex of the scutellum (his Fig. 11). Measurements presented in this redescription are based on 5 paratype males and 5 females (Holotype, 2 paratypes, 2 specimens from the locality of these paratypes, Continental, AZ.) [USNM].

Female: Length, 4.2-5.0 mm. Color metallic violet and green, blues rarely seen, generally green with violet reflections, except metasoma which is dark metallic green. Antennal scape metallic blue-green, pedicel, anellus, funicle and clava brown; labio-maxillary complex brown; mandible reddish in middle, dark at base and apex, base with violet reflections; wings darkened throughout; coxae, trochanters, femora and tibiae brown to reddish-brown, usually with distinct metallic reflections, tibiae yellow apically, pretarsi dark brown.

Head: length of malar space 0.23-0.27 eye height; OOL 0.64-0.79 POL; maximum width of scrobes 0.34-0.37 head width; head transverse, width:height = 1.23-1.34; gena well developed, head widest across genae; inner and outer orbits (parascrobal spaces) without distinct costae or rugae (Figs. 8,38), costulae only on genae and on face laterad of clypeus; clypeus transverse, width:height = 1.53-1.65, evenly covered with long setae, with indistinct punctures, surface polished, upper margin straight, lower margin emarginate, without tentorial pits; ocular-ocellar region and vertex smooth, with indistinct punctures, and glabrous area laterad of each posterior ocellus; vertex with well developed costae at posterior margin; supraclypeal area 0.46-0.57 clypeus height; lateral wall of scrobes merged smoothly with face (Fig. 8); lower tooth of mandible rounded at apex; base of mandible with distinct punctures; labio-maxillary complex short. Antennae: pedicel and funicular segments subequal in length; funicular segments transverse, except elongate F1; anellus 0.31-0.40 length of F1; scape narrowly linear, length 4.0-4.8 maximum width.

Mesosoma: PN:MSC = 0.36-0.37; scutellum short, slightly longer than mesoscutum, SC:MSC = 1.04-1.17; dorsum of pronotum punctate-reticulate, punctures coalesced in form of indistinct irregular transverse costulae medially, lateral punctures distinctly circular; midlobe of mesoscutum with incomplete irregular transverse rugae, reticulate along notauli, sculpture in many specimens less distinct mesad (Fig. 12); sidelobe of mesoscutum completely sculptured, with punctures anteriorly along notauli, laterally reticulate-rugose to rugose posteriorly; notauli distinct; scutellum with well developed cross-arcuate costae, underlying surface with punctures along axillula; apex of scutellum without distinctly septate marginal rim; scutellum broadly rounded (Fig. 12); underside of scutellum smooth; propodeum vertical, with distinct median furrow, submedian areas polished with dense transverse costulae, callus reticulate-rugose (Fig. 17); postspiracular sclerite abruptly narrowed ventrally, sinuous, with shallow fovea coextensive with most of upper postspiracular sclerite, in many specimens with faint punctures below fovea (Fig. 36); axilla reticulate-rugose above, below with irregular rugae; axillula with one to three well developed oblique costae (Fig. 36). Forewing: stigmal vein slightly shorter than marginal, postmarginal about three times length of marginal vein (Fig. 59).

Metasoma: T2 with median longitudinal row of closely spaced punctures extended two-thirds distance to T2/T3 border and with lateral arcuate lines of punctures joined to apex of median row (Fig. 29); T2 with sparse setae, without punctures, border between T2 and T3 sinuous and indistinct; T3 more quadrate than in *E. triangularis* group, length about one-half maximum width (0.52-0.57), with lateral patches of setae, and distinct punctures; T4 and T5 with well developed punctures extended transversely across anterior surface of terga.

Male: Length, 3.7-4.6 mm. Color as in female. Structure and sculpture as in female, except; Head: antennal scape, in frontal view, expanded only slightly, length 3.9-4.4 maximum width, without punctures, outer surface with strong setae and roughened with punctures (Fig. 43), inner surface without distinct punctures; pedicel quadrate; anellus relatively shorter, 0.10-0.26 length of F1; funicle stouter. Mesosoma: PN:MSC = 0.33-0.40; SC:MSC = 1.08-1.26. Metasoma: T3 more transverse, length about one-third width. Subgenital plate (Fig. 68): transverse, sides gradually divergent, widest along sternite 8, width 2.05-2.23 length along midline [n=4]. Genitalia (Fig. 73): digiti with three or four large teeth and single smaller tooth; ventral lobe acuminate, apex broadly rounded; lateral demelanized areas of basiparamere large, pigmented median area about equal in length to digiti.

Euperilampus triangularis group

Diagnosis.— This species group is characterized by massive scrobal walls which are sharply angulate at the level of the antennal toruli and merge abruptly with the face (Fig. 9). The apex of the scutellum is acuminate (Figs. 13-16), not broadly rounded as in *E. krombeini* (Fig. 12). The labio-maxillary complex is short (Fig. 9), not elongate as in *E. tanyglossa* and *E. aureicornis* (Fig. 4).

Geographical distribution.— This species group is widely distributed in eastern North America, into central Québec, and south to Florida; in the montane regions of México and in the montane regions of southern Brazil, northern Argentina, eastern Bolivia and Paraguay. There are no specimens from northern South America or Central America. This disjunction may simply be due to a paucity of montane collections.

Description.— A group description is provided, based on the presently included species: *E. triangularis*, *E. gloriosus*, *E. brasiliensis*, *E. enigma*, *E. luteicrus*, *E. ameca*, *E. iodes*, *E. solox*, and *E. magnus*. Measurements and ratios are presented in general terms and the ranges of numerical values are listed in Table 1 for the species represented by multiple specimens. The group descriptors are not repeated in the descriptions of the included species; a full description of each species is the group description with the appropriate numerical values from Table 1 and the species description.

Female: Length, 3.0-7.5 mm. Head, mesosoma and metasoma metallic (iridescent) violets, blues and greens with violet reflections, in some species with contrasting glossy black areas on head and mesosoma; antennal scape metallic green, pedicel brown with metallic reflections, anellus, funicle and clava dark brown, labio-maxillary complex dark brown; mandible, basally metallic, distally reddish-brown; wings darkened throughout; coxae, trochanters, femora and tibiae dark with metallic reflections (fore and mid tibiae yellow in *E. luteicrus*); distal end of tibiae light brown, tarsi yellow, pretarsi dark brown.

Head: Length of malar space about one-third eye height; lower margin of eyes extended to top of clypeus; base of mandible with distinct punctures; OOL approximately equal to POL; maximum width of scrobes one-third to one-half head width; head transverse, width:height = 1.0-1.2; vertical costae of inner orbits (parascrobal spaces) well developed, extended onto face and convergent with outer orbital costae on clypeus (Fig. 9); clypeus transverse, width about 1.5 times height, with costae at lateral margins, evenly covered with long setae; upper margin concave or straight, lower margin emarginate, without tentorial pits; vertex with well developed carina(e) at posterior margin and glabrous area laterad of each posterior ocellus; supraclypeal area about one-half clypeus height, glabrous and polished; lateral wall of scrobes merged abruptly with face, at level of antennal toruli (Fig. 9); lower tooth of mandible tapered to sharp point; labio-maxillary complex short (Figs. 9,55), extended just beyond mandibles. Antennae: pedicel and funicular segments subequal in length; funicular segments transverse except elongate F1; relative length of anellus to F1 diagnostic; scape narrowly linear, length about 5-6 times maximum width.

Mesosoma: sculpture diagnostic; pronotum one-third to one-half length of mesoscutum; scutellum longer than mesoscutum, SC:MSC diagnostic; notauli distinct; apex of scutellum with marginal rim; propodeum vertical, with median impressed foveae and raised submedian areas with transverse costae, callus reticulate-rugose (Fig. 19); postspiracular sclerite abruptly narrowed ventrally, sinuous, with single large fovea dorsally, size and shape of which is diagnostic, with some smaller punctures below fovea in some species. Forewing: stigmal vein shorter than marginal, postmarginal vein about three times length of marginal vein (Fig. 57).

Metasoma: smooth and shining, T2, T4, and T5 evenly covered with setae, T3 with lateral patches of setae, T4 with indistinct punctures at base of setae, punctures on T5 indistinct or well developed; T2 smoothly concave (Fig. 27), border between T2 and T3 sinuous and indistinct; T3 transverse, length about one-third maximum width (0.33-0.39).

Male: Length, 2.0-5.0 mm. Color as in female. Structure and sculpture as in female except; Head: relative length of malar space to eye height smaller, antennal scape, in frontal view, expanded slightly apically, length about four times maximum width; distribution of punctures and setae diagnostic; pedicel quadrate, shorter than F1; relative length of anellus to F1 shorter; funicle stouter. Mesosoma: costae on submedial areas of propodeum more prominent. Metasoma: T3 more transverse. Subgenital plate: subquadrate, abruptly expanded along sternite 8 (Fig. 67), width:length, 1.30-1.83 (n=15). Genitalia: diagnostic.

Euperilampus triangularis (Say)

(Figs. 1, 2, 3, 9, 11, 16, 19, 20, 21, 27, 37, 39, 44, 53, 55, 57, 67)

Perilampus triangularis Say, 1828:78. [Type lost].
Euperilampus triangularis; Crawford, 1914:69.

Type Locality.— U.S.A., Indiana.

Material Examined.— U.S.A. (310 Females, 182 Males): Alabama, Arkansas, Connecticut, District of Columbia, Florida, Illinois, Indiana, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Dakota, Texas, Vermont, Virginia, West Virginia, Wisconsin. Canada (8 Females, 6 Males): Québec: Aylmer, Lac Chicobi, Montreal. Ontario: Ottawa, Point Pelee, Ruby.

Notes about synonymy.— Burks (1969) compared *E. triangularis* with *E. krombeini* and illustrated the head of *E. triangularis* (his Fig. 11) as *E. hyalinus*. (*lapsus calami*) in the figure legends. Bouček (1978) illustrated the apex of the scutellum of *E. triangularis* (his Fig. 10). *E. triangularis sensu* Bouček is coextensive with my *E. triangularis* species group.

Diagnosis.— This species is reliably distinguished from other members of the *E. triangularis* group by having a concolorous mesoscutum, i.e., without contrasting black areas on the sidelobe, and axillulae with distinct costae, the most ventral of these merging with the posterior border of the axillulae (Fig. 53; cf. Fig. 54, *E. brasiliensis*). Sculpture on the scutellum is less developed along the midline, the rugae incomplete (Fig. 16; cf. Fig. 13, *E. iodes* and Fig. 14, *E. brasiliensis* and Fig. 15, *E. solox*).

Geographical distribution.— This species is widely distributed in eastern North America, extending to western South Dakota (Custer Co., Lawrence Co.), eastern Kansas (Riley Co.), and east Texas (Galveston Co.). The distribution matches closely the extent of broadleaf deciduous forests. Western extremes in the range are along tributaries of the Missouri River: riparian areas with broadleaf deciduous forests. Representative collection dates are as follows: New York, June 30 - September 1; Massachusetts, June 24 - September 10; Québec, July 1 - August; Kansas, June 20 - July 1.

E. triangularis has been collected frequently in Highlands Co., Florida at the Archbold Research Station [FSCA]. This is an area of needleleaf evergreen forest and violates the distributional correlates established above. These specimens show some morphological peculiarities (see 'Variation' section). Collection dates also differ dramatically from the northeastern material and range from March 2 - May 30 (based on 70 specimens). Other specimens from Florida (all northern Florida) also were collected between these dates. This species has not been recorded from Georgia, South Carolina, Mississippi, Tennessee, Kentucky or Louisiana. Excluding Florida, North Carolina is the most southern record of this species along the east coast, and specimens have been taken May 16 (Columbus Co., coastal), May 20 (Black Mts.), July 27 (Haywood Co., Blue Ridge Mts.), September 23 (Buncombe Co., Blue Ridge Mts.).

The temporal separation of *E. triangularis* into spring and late summer collection dates is probably related to overwintering of hosts in northern and montane areas. Direct development of the hosts in the southern extremes of the range would explain occurrence of specimens in April and May. Unfortunately the host(s) of *Euperilampus triangularis* in Florida is unknown.

Bouček examined North American material and specimens from Santa Catarina, Brazil (Nova Teutonia). Bouček (1978) lists material from Colorado, as does Peck (1951, 1963), and Burks (1979), apparently in reference to Ashmead (1890). I have seen no specimens from the Rocky Mountains or from Colorado.

Host associations.— *Euperilampus triangularis* is a secondary parasite (hyperparasite) of the fall webworm, *Hyphantria cunea* (Drury) [Arctiidae]. Warren and Tadic (1970) reared *E. triangularis* as a parasitoid of *Hyposoter fugitivus* (Say) [Ichneumonidae] which attack the fall webworm as primary parasitoids (13 females, 28 males). This material was misidentified as *Perilampus hyalinus*, although *P. hyalinus* was also reared from *Hyposoter* (six females, two males) and other primary parasitoids [series examined, UA]. Rearings of *Hyphantria cunea* in New York (Darling, unpublished) have also yielded both *P. hyalinus* and *E. triangularis*. Other parasitoids obtained in the New York rearings included only Tachinidae [*Eusisyropa blanda* (O.S.), *Blondelia hyphantriae* (Tothill) and *Mericia ampelus* (Wlk.)] and Ichneumonidae [*Therion* spp. and *Sinophorus validus* (Cresson) complex] [CU, UG, DCD]. The host of *Euperilampus triangularis* in New York has yet to be determined. I also have seen a specimen of *E. triangularis* reared from *H. cunea* from Ruby, Ontario, Canada [CNC].

Description.— The redescription and measurements are based on 17 females and 18 males, three specimens of each sex from the following six localities, except where noted otherwise: Florida, Highlands Co., Archbold Biological Station [FSCA]; Virginia, Arlington Co., Kearney Sta. [USNM]; Arkansas, Washington Co., Fayetteville, Ex: *Hyposoter* spp, parasite of *Hyphantria cunea* [UA]; Canada, Québec, various localities, and 1 Female from Ruby, Ont. [CNC, USNM]; Kansas, various localities (only 2 Females examined) [UK, KSU, USNM]; New York, Seneca Co., Geneva, Ex: culture of *Hyphantria cunea* [DCD, UG].

Female: Length, 2.9-6.3 mm. Color ranging from blue-violet to blue-green, with violet reflections on mesoscutum and green reflections on metasoma, without contrasting black areas on sidelobe of mesoscutum.

Head: maximum width of scrobes 0.28-0.35 head width; margin of scrobes, in frontal view, sinuous and flared at level of antennal toruli (Fig. 11); inner orbital costulae irregularly spaced, wavy to rugose (Fig. 9), convergent toward posterior ocellus and not extended through ocular-ocellar region (Fig. 21); outer orbital costae various, restricted to malar region or extended to vertex, less developed above; vertex almost completely sculptured (punctures and indistinct rugae), except for glabrous area laterad of each posterior ocellus; clypeus with indistinct arcuate costae at extreme lateral margins, punctures well developed and dense, surface appearing roughened. Antennae: anellus 0.18-0.25 length of F1, relatively shorter than in other species (see Table 1).

Mesosoma: scutellum longer than mesonotum, SC:MSC = 1.42-1.60; dorsum of pronotum punctate-reticulate, punctures coalesced in form of transverse rugae anteriorly (as in Fig. 26), punctures along midline polygonal, not distinctly circular; midlobe of mesoscutum with transverse rugae, more irregular (reticulated) posteriorly, sidelobe of mesoscutum posteriorly rugose, anteriorly along notauli roughened with irregular punctures, laterally punctate-reticulate; scutellum with arcuate rugae, less developed along midline, and longitudinally rugose-reticulate laterally (Fig. 16); apex of scutellum with distinctly septate marginal rim; scutellum acuminate, sides convergent at about 60 degrees; underside of scutellum sculptured (Fig. 39); median area of propodeum with deeply impressed foveae, in form of distinct X-shape (Fig. 19), submedian areas polished with cross-arcuate costulae throughout; postspiracular sclerite with large, round, centrally-located fovea (Fig. 37); axilla reticulate-rugose above, rugose below; axillula smooth and shining, with one to three short oblique costae, ventral costa in most specimens merged with posterior border of axillula (Fig. 53).

Metasoma: T5 with indistinct punctures.

Male: Length, 2.3-5.2 mm. Color as in female. Structure and sculpture as in female except, Head: antennal scape, in frontal view, expanded slightly apically, smooth (Fig. 44); anellus relatively smaller, 0.10-0.15 length of F1, relatively shorter than other species (see Table 1). Mesosoma: propodeum more coarsely sculptured with more prominent cross-arcuate costae. Genitalia (Figs. 1,2): digiti with three, four, or five large teeth and two or three smaller teeth; ventral lobe rounded, not distinctly acuminate but in few specimens notched at apex; lateral demelanized areas of basiparamere large and quadrate, not reduced laterally, pigmented median area shorter than length of digiti [n-17].

Variation.— The reared series of *E. triangularis* from Arkansas differs considerably from wild caught specimens. The Arkansas series consists of extremely small individuals about 3 mm in length. In these specimens the sculpture of the propodeum is quite distinctive with the median triangle about half the height of the propodeum (compare Fig. 20, reared from

Hyposoter and Fig. 19, wild caught specimens from Archbold Research Station). Of the total material examined, only five wild caught specimens (1.1%) are as small as this reared material (MSC < .75 mm). In these wild caught specimens, the propodeum is of the standard configuration, with the median triangle quite small. It is possible that the rearing conditions were sub-optimal, resulting in these abnormally small individuals, with the associated variation in propodeum structure. All wild caught specimens from Arkansas (n=3) are of normal size (5.00-5.83 mm) and the propodeal triangle is not enlarged. A single small specimen from Ruby, Ontario [CNC], again reared from *H. cunea*, has the unusually large propodeal triangle.

Florida specimens also differ from northeastern material. Inner orbital costae and transverse rugae of the midlobe of the mesoscutum are very irregular, especially in males. Florida specimens also have relatively longer scutella, SC:MSC, than specimens from other areas (males, 1.69-1.75; all other localities, 1.42-1.60. females, 1.55-1.56; all other localities, 1.42-1.55). Male genitalia of New York specimens (n=6), Florida (n=6), Virginia (n=2), and Arkansas, reared from *Hyposoter* (n=2), show no consistent differences.

The apex of the scutellum is quite aberrant in four specimens. Variants include deeply cleft and bilobed apices, and asymmetrical developments of the normal acuminate apex. The most striking variant is a deeply bilobed apex which is bent under the vaulted part of the scutellum so that the marginal rim is not visible in dorsal view. This specimen, a female from Highlands Co., Florida, was among four normal specimens from the same Malaise trap collection [FSCA]. In addition, the reared series from Arkansas have many specimens with truncate scutella, shallowly cleft at the apex.

The status of the Florida population will have to be reconsidered when the host association(s) is determined. Possibly this population represents a sibling species related to *E. triangularis*. Description of such a sibling species from eastern North America will present 'exceptional circumstances', as outlined by Article 75 of the International Code of Zoological Nomenclature. A neotype will have to be designated for Say's species, to fix the name with the northern population. A suitable topotypic specimen is in the Cornell collection, [Female: Indiana, Madison, July 29 1957, H.E. Evans]. This specimen agrees with all the particulars of this redescription.

Euperilampus gloriosus (Walker)

Perilampus gloriosus Walker, 1862:375.
Euperilampus gloriosus; Walker, 1871:67.
Euperilampus gloriosus; Bouček, 1978:304 [lectotype designation].

Type Locality.— México.

Type Material.— Lectotype (male, BMNH) [not examined].

Diagnosis.— The following is based on notes of A.B. Gahan [USNM], Burks (1969), and Bouček (1978). This species can readily be distinguished from all other New World species of *Euperilampus* by the scutellum, which is rather abruptly produced into a lanceolate spine (Fig. 9 in Bouček 1978) and by the bright coppery to fiery golden color of the apex of the scutellum and the metasoma.

The species is known only from the type material. The specimen was collected by M. Sallé; the exact locality in México is apparently unknown.

Euperilampus magnus n. sp.
(Fig. 7)

Type Locality.— México, Chiapas, Chiapa de Corzo.

Type Material.— Holotype (Female, CAS): Mexico, Chiapas, Municipio Chiapa de Corzo, El Chorreadero, 670 m (Aug 16 1976, DE/JA Breedlove).

Diagnosis.— The relatively short scutellum,. SC:MSC = 1.24, separates the holotype from all species except the *E. brasiliensis* complex. The specimen differs from *E. brasiliensis* complex females by the absence of contrasting black areas on the sidelobe of the mesoscutum and by the margin of the scrobes not being flared at the level of the antennal toruli (Fig. 7). The reliability of size in recognizing this species must await further collecting. This specimen is 1.2 times larger than any other New World specimen.

Geographical distribution.— The type locality is in the interior highlands of Chiapas and is the only Mexican locality for *Euperilampus*, east of the Isthmus of Tehuantepec.

Derivation of specific epithet.— From the Latin, with reference to the large size of the holotype.

Description.—

Female: Length, 7.5 mm. Color ranging from blue-violet to blue-green, with violet and green reflections, and glossy black posteriorly on vertex, but without contrasting black areas on sidelobe of mesoscutum.

Head: Length of malar space 0.36 eye height; OOL = 0.83 POL; maximum width of scrobes 0.35 head width; margin of scrobes, in frontal view, smoothly curved, not flared at level of antennal toruli (Fig. 7); gena very well developed, head widest across genae; head transverse, width:height = 1.2; inner orbital costulae irregularly spaced, convergent on posterior ocellus and not extended through ocular-ocellar region (as in *E. triangularis*, Fig. 21); outer orbital costulae extended past point of maximum width of eye but not to vertex; vertex almost smooth, posteriorly with seven transverse costulae; clypeus transverse, width:height = 1.55, with indistinct arcuate costae at extreme lateral margins, punctures distinct and dense, surface appearing roughened; supraclypeal area 0.47 clypeus height. Antennae: anellus 0.18 length of F1; scape narrowly linear, length 4.6 times maximum width.

Mesosoma: PN:MSC = 0.50; scutellum slightly longer than mesoscutum, SC:MSC = 1.24; dorsum of pronotum punctate-reticulate, interspaces widened and punctures distinctly circular; midlobe of mesoscutum rugose, transverse rugae less wavy than in *E. solox* (cf. Fig. 15), sidelobe of mesoscutum posteriorly rugose, anteriorly along notauli roughened with irregular punctures, laterally punctate-reticulate; scutellum with arcuate rugae, less distinct on disk; apex of scutellum with distinctly septate marginal rim; scutellum acuminate, sides convergent at about 70 degrees; underside of scutellum smooth; median area of propodeum shallowly impressed, without deep foveae, submedian areas with swirling costae; postspiracular sclerite with large, round, centrally-located fovea, and smaller puncture below; axilla reticulate-rugose above, rugose below; axillula smooth and shining, with one to three short oblique costae not merged with posterior border.

Metasoma: T5 with distinct punctures.

Male: UNKNOWN.

Euperilampus solox n. sp.
(Figs. 15, 32, 47, 48, 76)

Type Locality.— Argentina, Tucuman, Tacanas.

Type Material.— Holotype (Female, IML): Argentina, Tucuman, Tacanas (Nov. 5 - 30 1968, L. Stange). Paratypes: (4 Females, 2 Males) all from Argentina. Tucuman, Trancas to Tacanas (Nov. 1-30, Stange) [Female, BMNH], (Jan., Arnau) [Female, USNM]. Salta: Alemanía (April, Stange/ Porter) [Female, CNC, identified as *Euperilampus triangularis* (Say) in Fidalgo 1980: 194]. Tucuman: San Pedro Colalao (Foerster), [Female, IESM]. Salta: Cerro San Bernardo (Feb., Monrós/ Willink). [Male, IML]. Tucuman: Trancas, San Pedro Colalao (Feb., Arnau) [Male, CNC].

Diagnosis.— *E. solox* is recognized by the reticulate-rugose sculpture of the midlobe of the mesoscutum (Fig. 15). The mesoscutum does not have contrasting black areas, which distinguishes the species from the *E. brasiliensis* complex. The fovea of the postspiracular sclerite is large but indistinctly impressed (Fig. 32) and the margins of the scrobes are flared at

the level of the antennal toruli (as in Fig. 11), distinguishing this species from *E. iodes* (cf. Fig. 10. *E. iodes*). *E. solox* does not have the reduced sculpture on the disk of the scutellum, which is characteristic of *E. triangularis* (Fig. 15; cf. Fig. 16. *E. triangularis*).

Geographical distribution.— *E. solox* is known only from northern Argentina. The host is unknown.

Derivation of specific epithet.— From the Latin, *solox*, for 'coarse or rough' with reference to the irregular sculpture of the mesoscutum.

Description.—

Female: Length, 5.4-6.2 mm. Color predominantly blue-green, with violet reflections, contrasting black areas restricted to vertex, not on mesoscutum.

Head: maximum width of scrobes 0.41-0.43 head width; margin of scrobes, in frontal view, sinuous and flared toward eye margin at level of antennal toruli (as in *E. triangularis*, Fig. 11); inner orbital costae rugose, extended to ocular-ocellar region; outer orbital costulae extended to vertex, less distinct above; vertex completely sculptured (coarse punctures and indistinct rugae), except for glabrous area laterad of each posterior ocellus; clypeus with indistinct arcuate costae at extreme lateral margins, punctures distinct and dense, surface appearing roughened. Antennae: anellus 0.26-0.35 length of F1.

Mesosoma: scutellum longer than mesoscutum, SC:MSC = 1.38-1.48; dorsum of pronotum punctate-reticulate, punctures not coalesced in form of distinct transverse rugae anteriorly, punctures circular or polygonal, interspaces widened; mesoscutum reticulate-rugose, with very irregular rugae anteriorly on midlobe (Fig. 15) and posteriorly on sidelobe, sculpture reduced along notauli; scutellum with irregular cross-arcuate rugae, laterally reticulate-rugose; apex of scutellum with distinctly septate marginal rim; scutellum acuminate, sides convergent at about 70 degrees; underside of scutellum sculptured at apex; median area of propodeum with deeply impressed foveae, in form of distinct V-shape, submedian areas polished, with seven or eight well developed and evenly distributed cross-arcuate costae; postspiracular sclerite with shallow circular fovea co-extensive with most of upper postspiracular sclerite (Fig. 32); axilla reticulate-rugose above, rugose below; axillula smooth and shining, without costae extended to posterior border (as in *E. brasiliensis*, Fig. 54).

Metasoma: T5 with well developed punctures, stronger than in other species of *E. triangularis* group.

Male: Length, 3.7-4.2 mm. Color as in female. Structure and sculpture as in female except, *Head*: Antennae: anellus relatively smaller; scape, in frontal view, expanded apically, with distinct punctures on anterior and inner surfaces, outer surface with strong setae, surface roughened (Figs. 47,48). Genitalia (Fig. 76): digiti with two to five large teeth and two smaller teeth; ventral lobe broadly rounded, notched in single specimen; lateral demelanized areas of basiparamere large and quadrate, not reduced laterally, pigmented median area slightly shorter than digiti [n=2].

Variation.— The sculpture of the mesonotum is less distinct in some specimens. The female specimen (USNM: Trancas to Tacanas) is a deep emerald green color due to cleaning the specimen in lacto-phenol to remove a fungal coating.

Euperilampus iodes n. sp.
(Figs. 10, 13, 23, 24, 31, 51, 52, 72)

Type Locality.— Brazil, Santa Catarina, Nova Teutonia.

Type Material.— Holotype (Female, CNC No. 17004): Brazil, Santa Catarina, Nova Teutonia, 300 - 500 m, (Feb. 1968, F. Plaumann). Paratypes (4 Females, 2 Males), same locality and collector as holotype (Aug., Sept., Oct.) [BMNH, CNC, IML].

Additional Material Examined.— Brazil, São Paulo, Barreiro, Serra de Bocãina, 1650 m (Sept., Alvarenga and Seabra) [Female, AEI]. México, Jalisco, 15 mi. S. Lagos de Moreno (Aug., 1962) [Female, NHMLAC].

Diagnosis.— This is the only species with the fovea of the postspiracular sclerite small and located on the anterior portion of the sclerite, leaving a large smooth triangular area posteriorly (Fig. 31). The concolorous mesoscutum and the relatively longer scutellum distinguish *E. iodes* from the *E. brasiliensis* group (see Table 1). This species differs from *E. solox* is having the margin of the scrobe smoothly curved, not flared at the level of the antennal toruli (Fig. 10; cf. Fig. 11, flared at level of toruli), and more regular sculpture on the mesoscutum (Fig. 13; cf. Fig. 15, *E. solox*). This species has the sculpture of the scutellum complete (Fig. 13), not reduced on the disk of the scutellum as in *E. triangularis*, (Fig. 16). *E. iodes* is the only species

with costae extending through the ocular-ocellar region along the eye margin (Figs. 23, 24; cf. Fig. 21, *E. triangularis* and Fig. 22. *E. brasiliensis*).

Geographical distribution.— *E. iodes* is sympatric with *E. brasiliensis* at Nova Teutonia, Brazil. Specimens are known only from México and Brazil, and the host is unknown. The description and measurements are based on the type material.

Derivation of specific epithet.— From the Greek, *iodes*, 'violetlike', with reference to color of adults of this species.

Description.—

Female: Length, 4.2-5.4 mm. Color predominantly blue-violet, with green reflections on scrobal cavity, supraclypeal area, pleuron of mesosoma and metasoma; without contrasting black areas on vertex and mesoscutum.

Head: maximum width of scrobes 0.38-0.40 head width; margin of scrobes, in frontal view, smoothly curved, not flared at level of antennal toruli (Fig. 10); inner orbital costae regularly spaced, outermost costulae extended around top of eye, through ocular-ocellar region (Figs. 23, 24); outer orbital costulae extended to vertex, less distinct above, but much more distinct along eye margin; vertex almost smooth, posteriorly with transverse costae; clypeus with well developed costae at lateral margins, punctures indistinct and sparse, surface smooth. Antennae: anellus 0.27-0.32 length of F1.

Mesosoma: scutellum longer than mesoscutum, SC:MSC = 1.38-1.50; dorsum of pronotum punctate-reticulate, punctures coalesced in form of distinct transverse rugae anteriorly, punctures along midline polygonal, not distinctly circular; midlobe of mesoscutum and entire scutellum with incomplete but regular cross-arcuate costae, sidelobe of mesoscutum posteriorly roughened, anteriorly along notauli with indistinct irregular punctures, laterally punctate-reticulate to rugose posteriorly (Fig. 13); apex of scutellum with distinctly septate marginal rim; scutellum acuminate, sides convergent at about 70 degrees; underside of scutellum sculptured at apex; median area of propodeum with deeply impressed foveae, in form of distinct V-shape, submedian areas smooth and shining, with indistinct cross-arcuate costulae dorsally; postspiracular sclerite with small fovea extended about one-half upper postspiracular sclerite, fovea anterior on postspiracular sclerite, with smooth triangular area in upper posterior corner (Fig. 31), axilla rugose; axillula smooth and shining, many specimens with 1-3 short costae.

Metasoma: T5 with indistinct punctures.

Male: Length, 3.7-3.9 mm. Color as in female, but contrasting black areas on vertex. Structure and sculpture as in female except, Head: Antennae: anellus relatively smaller, 0.14-0.25 length of F1; scape, in frontal view, expanded slightly apically, punctures on anterior and inner surfaces, outer surface with strong setae, surface roughened (Figs. 51, 52). Mesosoma: sculpture of sidelobe of mesoscutum either female condition or completely rugose along notauli; propodeum more coarsely sculptured with more prominent cross-arcuate costae and with fovea on submedian areas. Genitalia (Fig. 72): digiti with five large teeth and two smaller teeth; ventral lobe acuminate, not broadly rounded; lateral demelanized areas of basiparamere large and quadrate, pigmented median area shorter in length than digiti [n=2].

Variation.— The specimen from Barreiro, Brazil, differs from the type series in having the fovea of the postspiracular sclerite somewhat larger, and the inner orbital costae less developed along the top of the eye. The Mexican specimen is similar to the Barreiro specimen, but the lateral wall of the scrobe is not as prominent in lateral view and the wings are hyaline, not distinctly darkened.

Euperilampus brasiliensis complex

Diagnosis.— All species have black areas on the sidelobe which contrast with the otherwise metallic color. These areas are quite large and occupy the anterior one-half of the sidelobe, except in *E. ameca* (reduced to a narrow band along the notauli). Scutella are relatively shorter than in all other species of the *E. triangularis* group (Fig. 14), SC:MSC ranging from 1.19 to 1.31. The only exception is the holotype of *E. luteicrus*, SC:MSC = 1.45. The short scutella result in the sides of the scutellum being convergent at an angle of about 75 degrees (60 - 70 degrees in other species of the *E. triangularis* group). The upper postspiracular sclerite has a single large fovea which is not distinctly circular (Fig. 30).

Taxonomic note.— This complex is defined to encompass species related to *E. brasiliensis* as diagnosed above (*E. enigma*, *E. luteicrus*, and *E. ameca*). The paucity of material has presented many problems; all species are allopatric, and the three new species are based on single specimens. Association of sexes is further complicated by the fact that the type material

of *E. brasiliensis* is represented only by females.

Females of this complex from central South America are indistinguishable, but two distinct forms of males are present. A series of seven females from Nova Teutonia, Santa Catarina, Brazil, are here regarded as conspecific with the type of *E. brasiliensis* [type locality--Chapada, Brazil]. Three males from Nova Teutonia appear to be conspecific and are here described as the male of *E. brasiliensis*. A very distinctive male from Roboré, Bolivia, is described as *E. enigma* n. sp. This could be the male of *E. brasiliensis*; if so, the Nova Teutonia material would represent a new species. I decided to treat the Bolivian male as a new species, since this is a more conservative solution. The other possibility would be to associate the Bolivian male with the type material of *E. brasiliensis*, and to describe a new species for the Nova Teutonia material based on differences from the associated, Bolivian male. As treated here, *E. brasiliensis* and *E. enigma* are separated by the Paraguay River.

This complex is represented in México by two new species, each based on a single specimen. The hosts are not known for any species of this complex.

Euperilampus brasiliensis (Ashmead) n. comb.
(Figs. 14, 22, 26, 30, 40, 49, 54, 75)

Perilampus brasiliensis Ashmead, 1904: 467 (Plate 34, Fig. 4).

Type Locality.— Brazil, Chapada [Matto Grosso]. [Holland (1919:482) discusses the various expeditions of H.H. Smith. The 1881-1886 trip to Brazil spent considerable time along the upper waters of the Rio Paraguay and Rio Guapore in western Brazil near Chapada and Matto Grosso. Much of this material went to the Carnegie Museum and was studied by Ashmead.]

Type Material.— Lectotype (Female, USNM No. 56960) [Present designation]: Chapada, April, H.H. Smith Coll. Paralectotype (Female, USNM Paratype No. 56960): Chapada, Nov.

Material Examined.— Brazil (12 Females, 4 Males); Santa Catarina, Nova Teutonia 300 - 500 m. (Jan. - June, August, September; F. Plaumann) [AEI, BMNH, CNC, UK]. Argentina (1 Female, 1 Male) Misiones: Loreto (Dec.) [Female, UNLP], Iguazu (March) [Male, IML; identified as *Euperilampus triangularis* (Say) in Fidalgo 1980: 194]. Paraguay (1 Female): Independencia (Sept.) [UNLP].

Diagnosis.— Only the male of this species can be distinguished from other members of the *E. brasiliensis* complex. The male genitalia lack enlarged, recurved teeth on the digitus (Fig. 75; cf. Fig. 74, *E. enigma*), and the scape of the antenna has very weak punctures on the inner surface (Fig. 49; cf. Fig. 50, *E. enigma*; Figs. 45, 46, *E. luteicrus*).

Description.— The redescription and measurements are based on the type material and the specimens from Nova Teutonia.

Female: Length, 4.6-6.3 mm. Color predominantly blue-green, with violet reflections. Vertex, midlobe and sidelobe of mesoscutum, with contrasting glossy black areas.

Head: maximum width of scrobes 0.37-0.44 head width; margin of scrobes, in frontal view, sinuous and flared at level of antennal toruli (as in *E. triangularis*, Fig. 11); head widest across eyes; inner orbital costae not convergent on posterior ocellus or extended around top of eye, ended abruptly at ocular-ocellar region (Fig. 22); outer orbital costae short, largely confined to malar region; vertex almost smooth, posteriorly with transverse costae; clypeus with indistinct arcuate costae at extreme lateral margins, punctures indistinct, surface appearing smooth and polished. Antennae: anellus 0.23-0.33 length of F1.

Mesosoma: scutellum slightly longer than mesoscutum, SC:MSC = 1.19-1.31; dorsum of pronotum punctate-reticulate, punctures coalesced in form of transverse rugae anteriorly, punctures along midline polygonal, not distinctly circular (Fig. 26); midlobe of mesoscutum and entire scutellum with incomplete but regular cross-arcuate costae (Fig. 14), less distinct along scutellar sulcus, sidelobe of mesoscutum smooth anteriorly along notauli (black areas), laterally punctate-reticulate to rugose behind; apex of scutellum with distinctly or indistinctly septate marginal rim; scutellum slightly acuminate, sides convergent at about 75 degrees; underside of scutellum almost smooth (Fig. 40); median area of propodeum with deeply impressed foveae in form of distinct V-shape, submedian areas coriarious above and smooth below with one or two transverse costae; postspiracular sclerite with very large fovea extended entire length of upper postspiracular sclerite (Fig. 30); axilla rugose; axillula smooth and shining, costae not extended to posterior border (Fig. 54).

Metasoma: T5 with indistinct punctures.

Male: Length, 3.7-4.6 mm. Color as in female except, dark violet area can extend along entire midlobe of mesoscutum and scutellum. Structure and sculpture as in female except: Head: Antennae: anellus relatively smaller, 0.15-0.23 length of F1; scape, in frontal view, expanded slightly apically, smooth, punctures indistinct and restricted to inner surface, outer surface with strong setae, surface roughened (Fig. 49). Mesosoma: Propodeum more coarsely sculptured with more prominent transverse costae. Genitalia (Fig. 75): digiti with three, four, or five large teeth and two smaller teeth; ventral lobe broadly rounded; lateral demelanized areas of basiparamere reduced laterally, pigmented median area shorter than digiti [n=4].

Variation.— The Paraguayan specimen differs in a number of characteristics: sculpture of the midlobe of the mesoscutum is not reduced along the scutellar suture, and the axillula is not completely smooth but has a complete carina which parallels the ventral margin and defines a narrow finger-like region. This sculpture is different from that of *E. triangularis* which does not have a single carina but one to three oblique carinae (Fig. 53).

Euperilampus enigma n. sp.
(Figs. 50, 74)

Type Locality.— Bolivia, Santa Cruz, Roboré.

Type Material.— Holotype (Male, USNM No. 100318). Bolivia, Santa Cruz, Roboré (October 1959) [DCD Slide No. 73] [specimen donated to the USNM by UK]. See discussion under *E. brasiliensis* complex.

Diagnosis.— The holotype differs from all *E. brasiliensis* complex males by having large, recurved teeth on the digiti (Fig. 74; cf. Fig. 75, *E. brasiliensis* and Fig. 71, *E. luteicrus*). The distinct punctures on the anterior surface of the antennal scape (Fig. 50; cf. Fig. 49, *E. brasiliensis*), and the relatively large pronotum (PN:MSC=0.58) further distinguish the male of this species from those of *E. brasiliensis* [PN:MSC = 0.46-0.53]. There are fewer punctures on the scape than in *E. luteicrus* (Figs. 45, 46).

Taxonomic note.— A female specimen from Bolivia is tentatively associated with *E. enigma*: Female, Bolivia, Santa Cruz, Buena Vista (July 12 1971, Porter/Stange) [IML, identified as *Euperilampus triangularis* (Say) in Fidalgo 1980: 194; DCD Slide Nos. 135, 136, mouthparts, ovipositor]. This female is indistinguishable from *E. brasiliensis* and is not described.

Derivation of specific epithet.— From the Greek for 'something obscure, a riddle'; an allusion to the uncertain systematic affiliation of the holotype.

Description.—

Male: Length, 4.2 mm. Color predominantly blue-green, with violet reflections. Vertex, midlobe and sidelobe of mesoscutum with contrasting glossy black areas.

Head: Length of malar space 0.25 eye height; OOL = 0.87 POL; maximum width of scrobes 0.44 head width; margin of scrobes, in frontal view, sinuous, slightly flared at level of antennal toruli; head widest across eyes; head transverse, width:height = 1.17; inner orbital costae not convergent on posterior ocellus or extended around top of eye, ended abruptly at ocular-ocellar region (as in *E. brasiliensis*, Fig. 22); outer orbital costae short, largely confined to malar region; vertex almost smooth, posteriorly with transverse costae; clypeus transverse, width:height = 1.56, with indistinct arcuate costae at extreme lateral margins, punctures indistinct, surface appearing smooth and polished; supraclypeal area 0.52 clypeus height. Antennae: anellus 0.20 length of F1; scape, in frontal view, expanded slightly apically, length 4.53 times maximum width, with indistinct punctures on anterior and inner surfaces, outer surface with strong setae, surface roughened (Fig. 50).

Mesosoma: PN:MSC = 0.58; scutellum longer than mesoscutum, SC:MSC = 1.27; dorsum of pronotum punctate-reticulate, punctures coalesced in form of transverse rugae medially, punctures along midline polygonal, not distinctly circular; midlobe of mesoscutum and entire scutellum with incomplete but regular cross-arcuate costae (as in *E. brasiliensis*, Fig. 14), smooth along scutellar sulcus, sidelobe of mesoscutum with wide smooth area anteriorly along notauli (black areas), laterally punctate-reticulate to rugose behind; apex of scutellum with indistinctly septate marginal rim; scutellum slightly acuminate, sides convergent at about 75 degrees; underside of scutellum almost smooth (as in *E. brasiliensis*, Fig. 40); median area of propodeum with deeply impressed foveae in form of distinct V-shape, submedian areas distinctly coriarious with one or two transverse costae; postspiracular sclerite with very large fovea co-extensive with entire upper postspiracular sclerite; axilla rugose; axillula smooth and shining, costae not extended to posterior border (as

in *E. brasiliensis*, Fig. 54).

Metasoma: T5 with indistinct punctures. Genitalia (Fig. 74): digiti with three very large and three smaller teeth, teeth of right digitus recurved distally; ventral lobe broadly rounded; demelanized area of basiparamere large and quadrate, not reduced laterally, pigmented median area less than one-half length of digiti.

Female: UNKNOWN

Euperilampus luteicrus n. sp.
(Figs. 45, 46, 71)

Type Locality.— Mexico, Jalisco, Guadalajara.

Type Material.— Holotype (Male, USNM No. 100319): Mexico, Jalisco, 15 mi. NE Guadalajara (Sept. 17 1970, GE/RM Bohart) [DCD Slide No. 170, genitalia] [specimen donated to USNM by USU].

Diagnosis.— This holotype is the only New World specimen of *Euperilampus* with yellow fore and mid tibiae, concolorous with the tarsi. I expect the yellow tibiae will be diagnostic for the as yet unknown female. The antennal scape is covered with punctures (Figs. 45, 46), denser than in *E. enigma* (Fig. 50), and *E. brasiliensis* (Fig. 49). The scutellum is relatively longer than all other species in the *E. brasiliensis* complex, SC:MSC = 1.45, but the contrasting black areas on the sidelobe of the mesoscutum suggest affinities with *E. brasiliensis*.

Geographical distribution.— The type locality is in the Central Plateau region of México. Extent of range is unknown.

Derivation of specific epithet.— From the Latin (*luteus*, 'yellow' and *crus*, 'leg or shank'), with reference to the yellow fore and mid tibiae.

Description.—

Male: Length, 3.75 mm. Color predominantly blue-green, with violet reflections. Vertex, midlobe and sidelobe of mesoscutum with contrasting glossy black areas; fore and mid tibiae yellow, concolorous with tarsi.

Head: Length of malar space 0.25 eye height; OOL=POL; maximum width of scrobes 0.43 head width; margin of scrobes, in frontal view, sinuous, slightly flared at level of antennal toruli; head widest across eyes; head transverse, width:height = 1.19; inner orbital costae convergent on posterior ocellus, not extended around top of eye (as in *E. triangularis*, Fig. 21): outer orbital costae short, largely confined to malar region; vertex almost smooth, posteriorly with transverse costae; clypeus transverse, width:height = 1.60, with indistinct arcuate costae at extreme lateral margins, punctures indistinct, surface appearing smooth and polished; supraclypeal area 0.58 clypeus height. Antennae: anellus 0.12 length of F1; scape, in frontal view, expanded slightly apically, length 4.10 times maximum width, punctures dense and well developed on both anterior and inner surfaces, outer surface with strong setae, surface roughened (Figs. 45,46).

Mesosoma: PN:MSC = 0.57; scutellum longer than mesoscutum, SC:MSC = 1.45, relatively longer than other *E. brasiliensis* complex species (range, 1.19-1.31); dorsum of pronotum punctate-reticulate, punctures coalesced in form of transverse rugae anteriorly, punctures along midline distinctly circular; midlobe of mesoscutum and entire scutellum with incomplete but regular cross-arcuate costae (as in *E. brasiliensis*, Fig. 14), smooth along scutellar sulcus, sidelobe of mesoscutum with wide smooth area anteriorly along notauli (black areas), laterally punctate-reticulate to rugose behind; apex of scutellum with distinctly septate marginal rim; scutellum slightly acuminate, sides convergent at about 75 degrees; underside of scutellum almost smooth; median area of propodeum with deeply impressed fovea in form of distinct V-shape, submedian areas smooth with few transverse costae and finer costulae; postspiracular sclerite with very large fovea co-extensive with entire upper postspiracular sclerite; axilla rugose; axillula smooth and shining, costae not extended to posterior border (as in *E. brasiliensis*, Fig. 54).

Metasoma: T5 with indistinct punctures. Genitalia (Fig. 71): digiti with three or four large teeth and two smaller teeth; ventral lobe broadly rounded; demelanized lateral areas of basiparamere large and oval, not reduced laterally, pigmented median area notched laterally and shorter than length of digiti.

Female: UNKNOWN

Euperilampus ameca n. sp.

Type Locality.— México, Nayarit, Santa Isabel.

Type Material.— Holotype (Female, USNM No. 100320): Mexico, Nayarit, 9 mi. NW Santa Isabella [= Isabel] (March 10 1972, Parker/Miller).

Diagnosis.— The holotype female differs from *E. brasiliensis* by having sidelobe of the mesoscutum almost completely sculptured and with the contrasting black areas very small and adjacent to the notauli. The short scutellum, SC:MSC = 1.30, establishes this species as a member of the *E. brasiliensis* complex.

Geographical distribution.— The type locality is in the Sierra Madre Occidental in the drainage of the Ameca River.

Derivation of the specific epithet.— A noun in apposition, from Ameca River.

Description.—

Female: Length, 5 mm. Color predominantly blue-green, with violet reflections. Vertex and midlobe of mesoscutum with contrasting glossy black areas, sidelobe of mesoscutum with black areas restricted to narrow band along anterior portion of notauli (much smaller than in other *E. brasiliensis* complex species).

Head: Length of malar space 0.29 eye height; OOL=0.94 POL; maximum width of scrobes 0.41 head width; margin of scrobes, in frontal view, sinuous and flared at level of antennal toruli (as in *E. triangularis*, Fig. 11): head widest across eyes; head transverse, width:height = 1.24; inner orbital costae not convergent on posterior ocellus or extended around top of eye, ended abruptly at ocular-ocellar region (as in *E. brasiliensis*, Fig. 22); outer orbital costae short, largely confined to malar region; vertex almost smooth, posteriorly with transverse costae; clypeus transverse, width:height = 1.59, with indistinct arcuate costae at extreme lateral margins, punctures indistinct, surface appearing smooth and polished; supraclypeal area 0.51 clypeus height. Antennae: anellus 0.25 length of F1; scape narrowly linear, length 4.53 times maximum width.

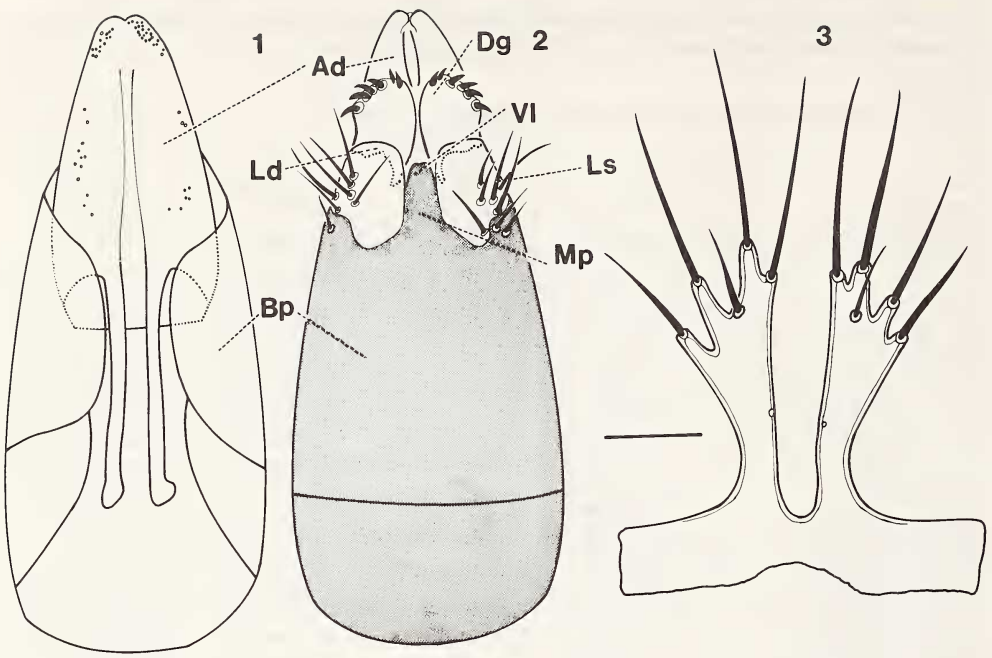
Mesosoma: PN:MSC = 0.43; scutellum longer than mesoscutum, SC:MSC = 1.30; dorsum of pronotum punctate-reticulate, punctures coalesced in form of transverse rugae medially, punctures along midline polygonal, not distinctly circular; midlobe of mesoscutum and entire scutellum with incomplete but regular cross-arcuate costae, sidelobe of mesoscutum without conspicuous smooth area anteriorly along notauli, this area roughened by indistinct rugae, laterally punctate-reticulate to rugose behind; apex of scutellum with distinctly septate marginal rim; scutellum slightly acuminate, sides convergent at about 75 degrees; underside of scutellum almost smooth (as in *E. brasiliensis*, Fig. 40); median area of propodeum with deeply impressed foveae in form of distinct V-shape, submedian areas coriarious with single transverse costa dorsally; postspiracular sclerite with very large fovea co-extensive with entire upper postspiracular sclerite; axilla rugose; axillula smooth and shining, costae not extended to posterior border (as in *E. brasiliensis*, Fig. 54).

Metasoma: T5 with indistinct punctures.

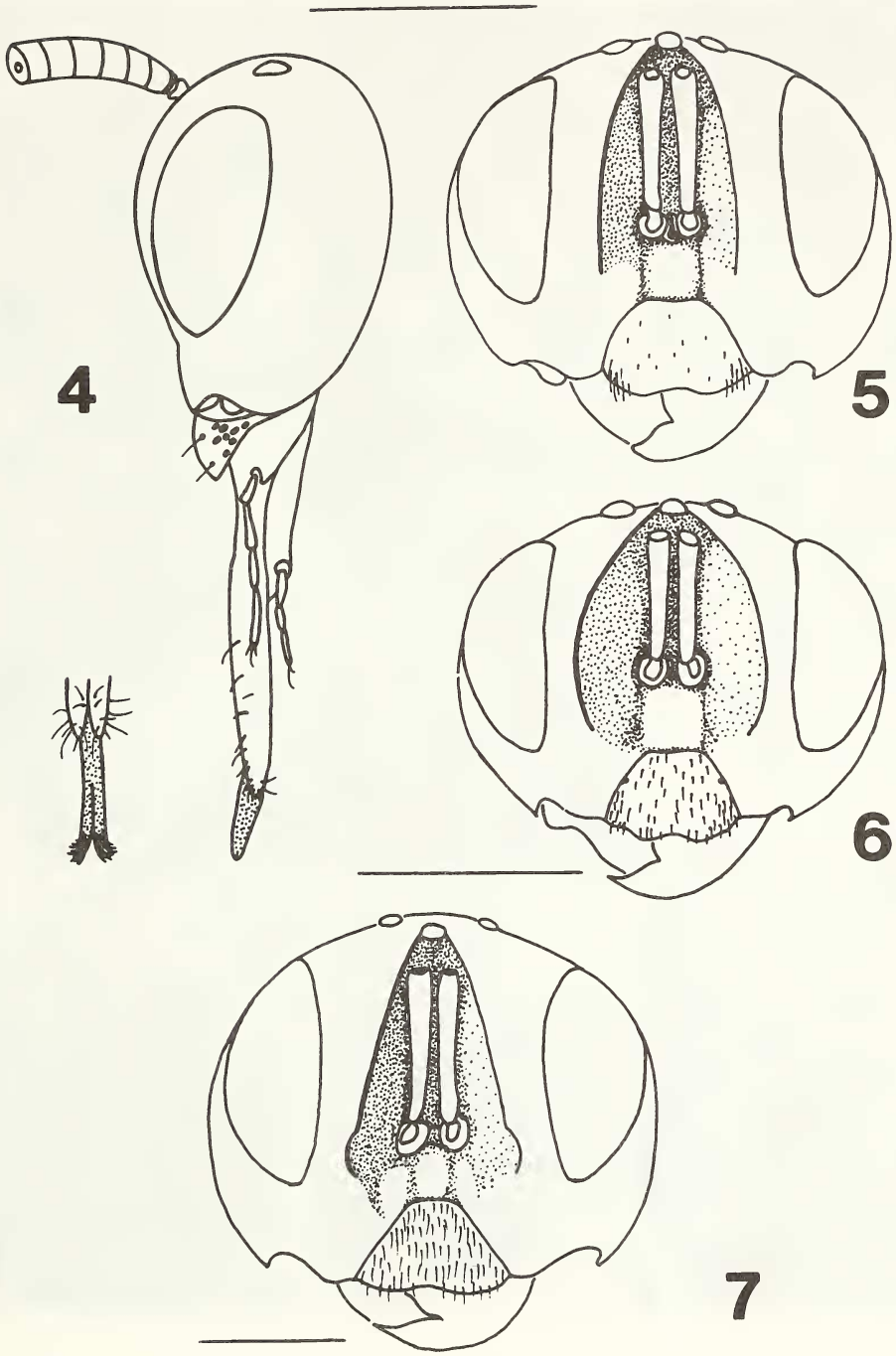
Male: UNKNOWN

Table 1: Metric descriptors, for species of the *Euperilampus triangularis* species group, known from multiple specimens (see discussion of *E. triangularis* species group). Measurements as defined in 'Methods and Terms'. Diagnostic characters indicated by asterisk (*). [F, females; M, males.]

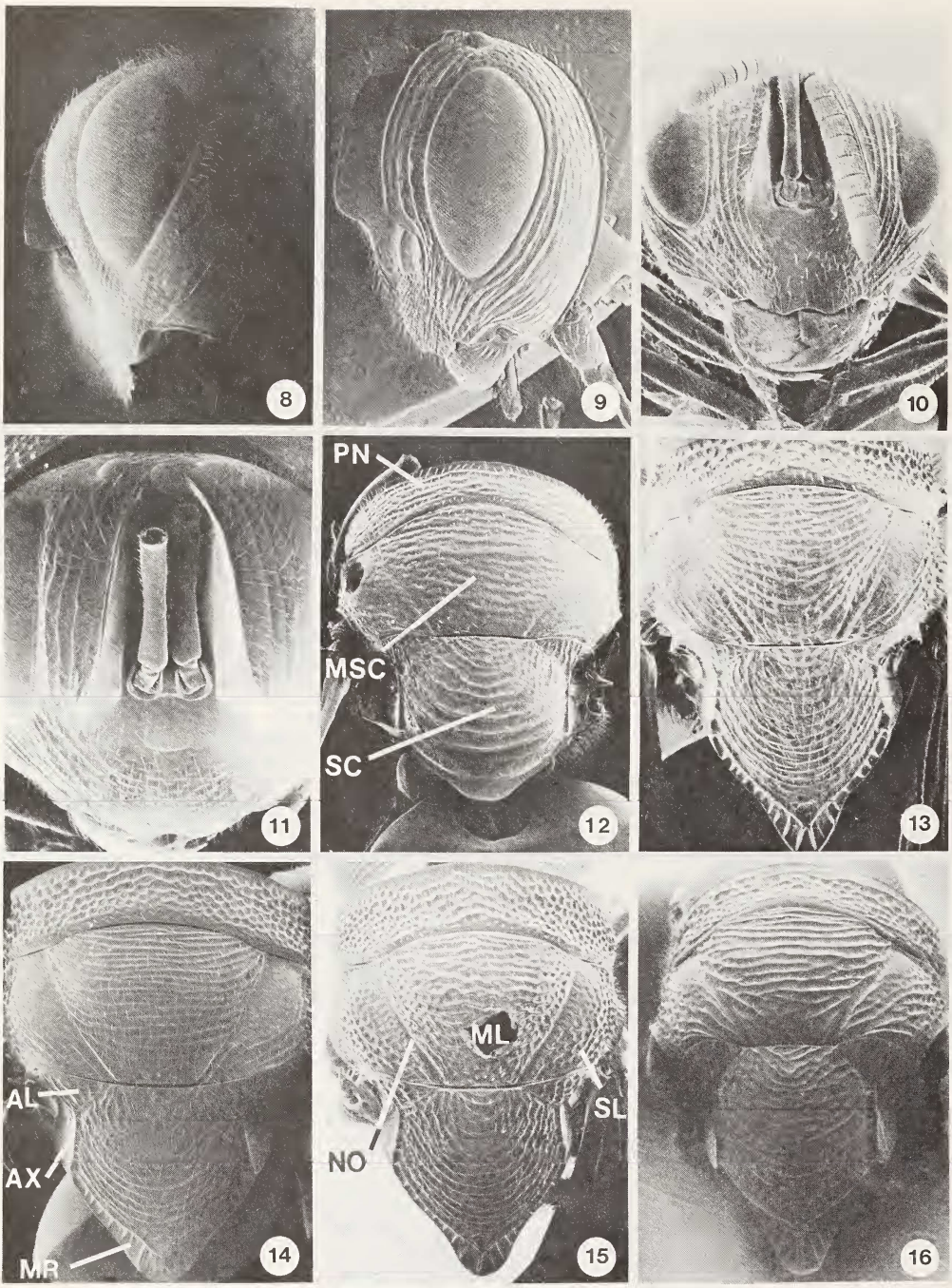
	Euperilampus			
Character	*iodes*	*solox*	*brasiliensis*	*triangularis*
MS/EH F	0.32-0.36	0.32-0.35	0.30-0.34	0.28-0.35
MS/EH M	0.30-0.33	0.28-0.31	0.23-0.24	0.22-0.29
*A/F1 F	0.27-0.32	0.26-0.35	0.25-0.33	0.18-0.25
*A/F1 M	0.14-0.25	0.21	0.15-0.23	0.10-0.15
SL/SW F	4.60-5.30	4.50-5.00	5.00-5.70	5.50-6.00
SL/SW M	4.00	4.20	4.30-4.80	3.80-4.20
PN/MSC F	0.30-0.41	0.42-0.47	0.40-0.46	0.34-0.44
PN/MSC M	0.43	0.46-0.50	0.46-0.53	0.35-0.48
*SC/MSC F	1.30-1.50	1.34-1.48	1.19-1.31	1.42-1.60
*SC/MSC M	1.36-1.43	1.43-1.50	1.24-1.31	1.42-1.75
HW/HL M & F	1.10-1.22	1.13-1.22	1.10-1.20	1.09-1.20
SH/CH M & F	0.44-0.55	0.46-0.59	0.45-0.52	0.41-0.52
CW/CH M & F	1.41-1.50	1.50-1.57	1.45-1.52	1.43-1.52
SW/HW M & F	0.38-0.40	0.41-0.43	0.37-0.44	0.41-0.47
OOL/POL M & F	1.00	0.79-1.03	0.68-0.94	0.70-1.00
# Males	2	2	4	18
# Females	7	5	12	17



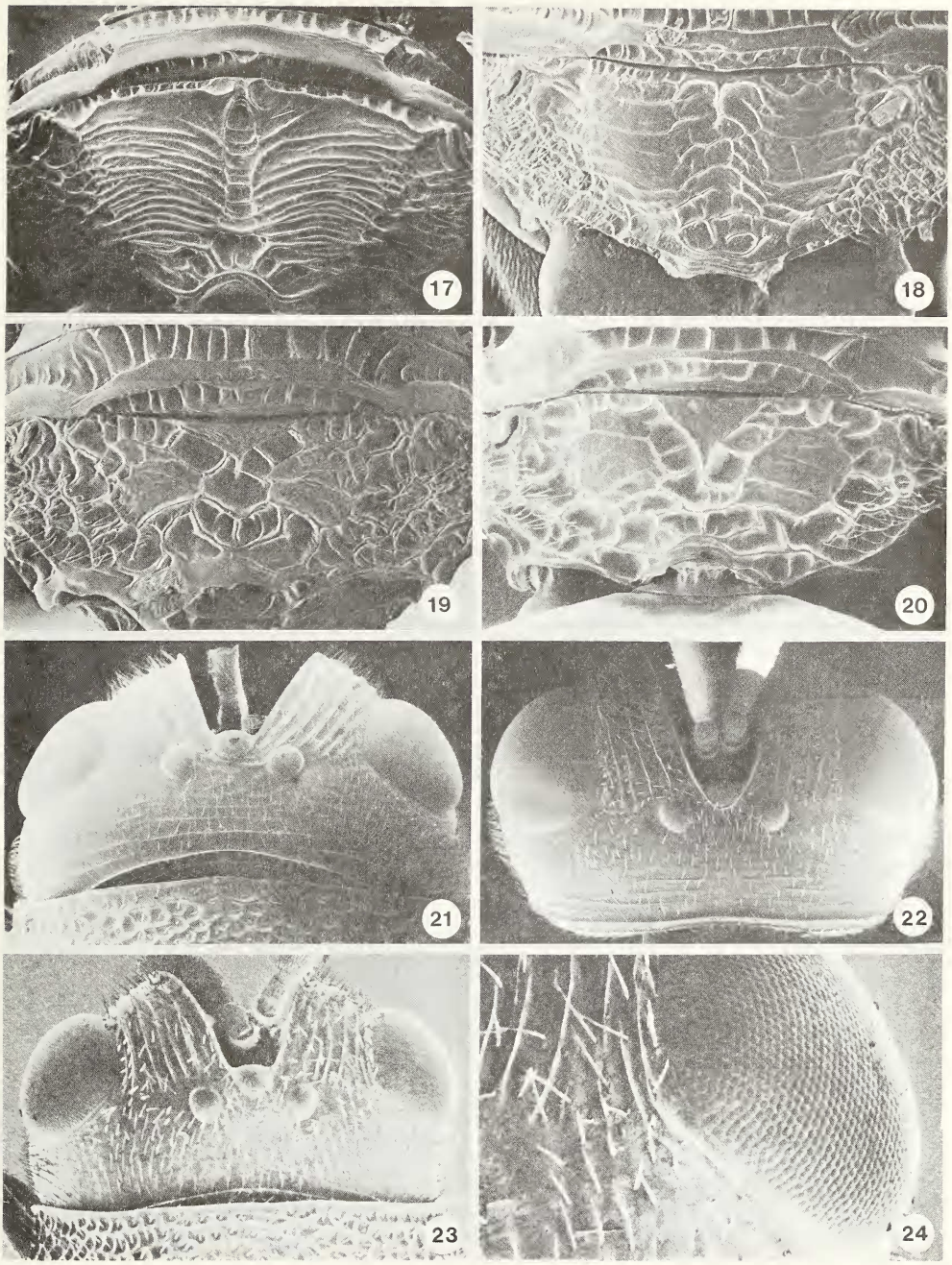
Figs. 1–3. Generic characters of *Euperilampus*. 1. Male genitalia *E. triangularis*, dorsal. 2. Male genitalia *E. triangularis*, ventral [Ad, adeagus; Bp, basiparamere; Dg, digitus; Ld, lateral demelanized area of basiparamere; Ls, lateral setae; Mp, median pigmented area; Vl, ventral lobe of basiparamere]. 3. Labrum *E. triangularis*, dorsal view. Scale line 0.1 mm.



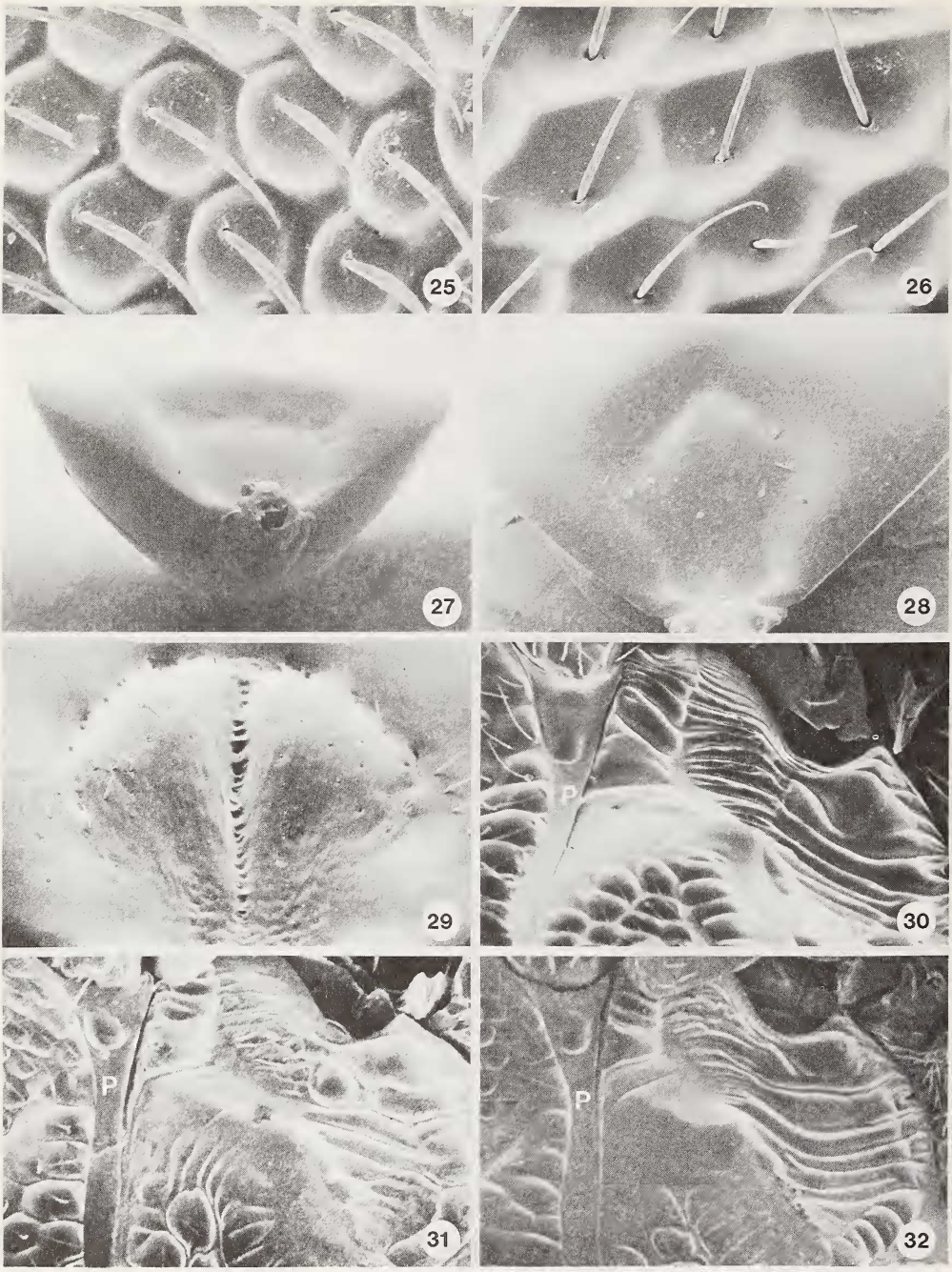
Figs. 4–7. Heads. 4. *E. tanyglossa*, female paratype; lateral. Inset; apex of labio-maxillary complex, anterior. 5. *E. tanyglossa*, female paratype; frontal. 6. *E. aureicornis*, female holotype; frontal. 7. *E. magnus*, female holotype; frontal. Scale line 1 mm.



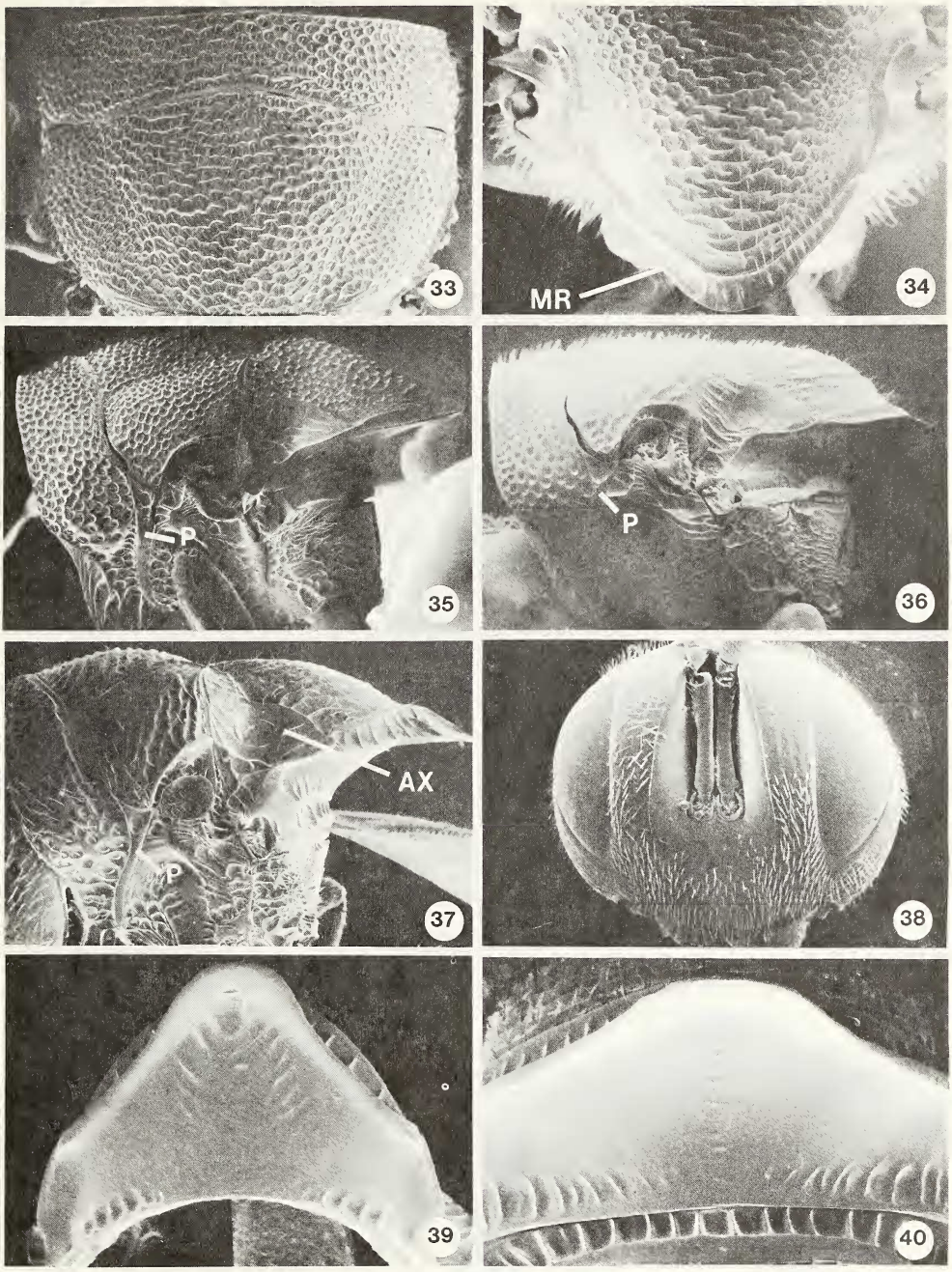
Figs. 8–16. 8–11. Heads. 8. *E. krombeini*; lateral. 9. *E. triangularis;* lateral. 10. *E. iodes*; frontal. 11. *E. triangularis;* frontal. 12–16. Mesosomata, dorsal. 12. *E. krombeini*. 13. *E. iodes*. 14. *E. brasiliensis*. 15. *E. solox*. 16. *E. triangularis* [AL, axilla; AX, axillula; ML, midlobe of mesoscutum; MR, marginal rim of scutellum; MSC, mesoscutum; NO, notaulix; PN, pronotum; SC, scutellum; SL, sidelobe of mesoscutum].



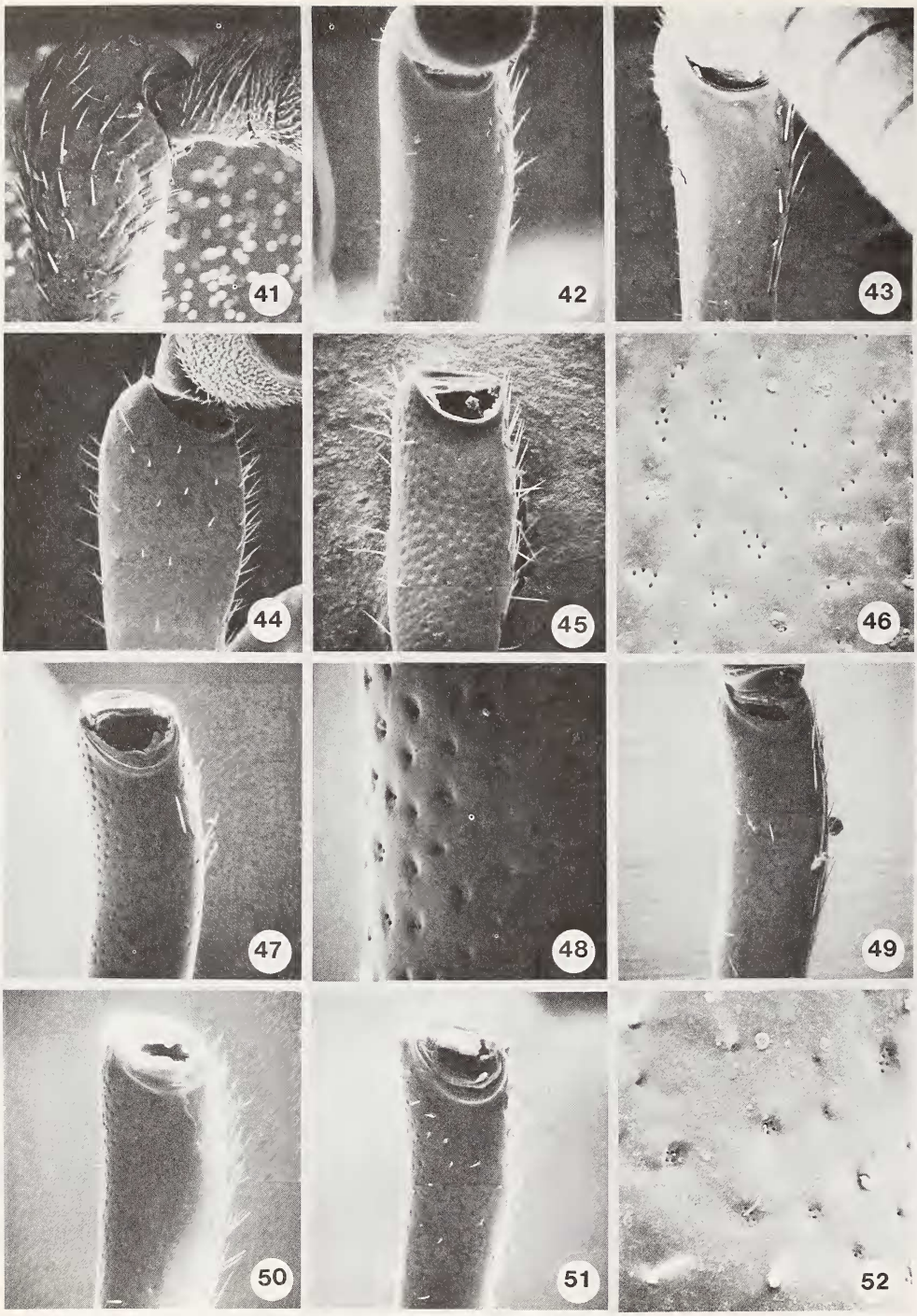
Figs. 17–24. 17–20. Propodea. 17. *E. krombeini*. 18. *E. tanyglossa*. 19. *E. triangularis*, Florida; length = 5.4 mm. 20. *E. triangularis* reared from *Hyposoter*, Arkansas, length = 2.9 mm. 21–24. Heads, dorsal. 21. *E. triangularis*. 22. *E. brasiliensis*. 23. *E. iodes*. 24. *E. iodes*; higher magnification, illustrating costae extending through ocular-ocellar region along eye margin.



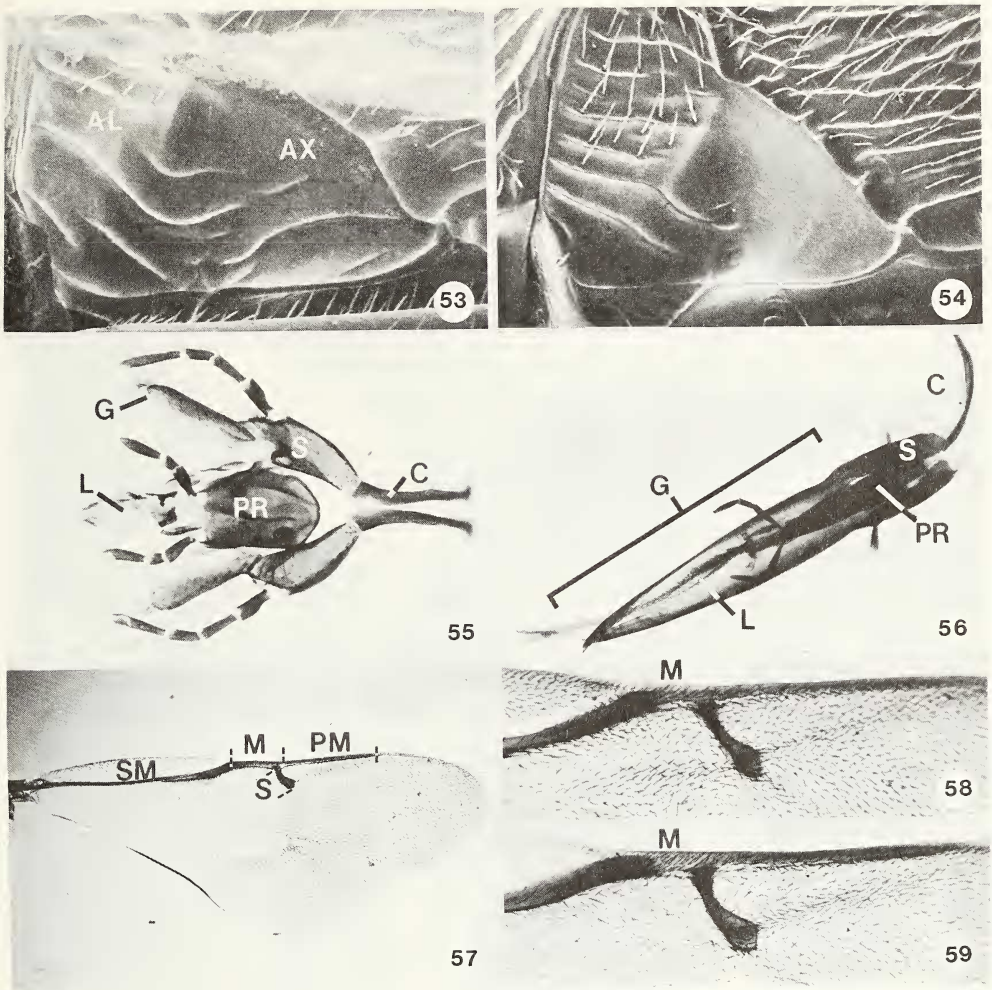
Figs. 25–32. 25.–26. Sculpture types. 25. Punctate-reticulate, pronotum of *E. tanyglossa*. 26. Punctate-reticulate, punctures coalesced to form irregular rugae, pronotum of *E. brasiliensis*. 27–29. Second metasomal tergites. 27. *E. triangularis*. 28. *E. tanyglossa*. 29. *E. krombeini*. 30–32. Mesosomata, lateral. 30. *E. brasiliensis*. 31. *E. iodes*. 32. *E. solox* [P, postspiracular sclerite].



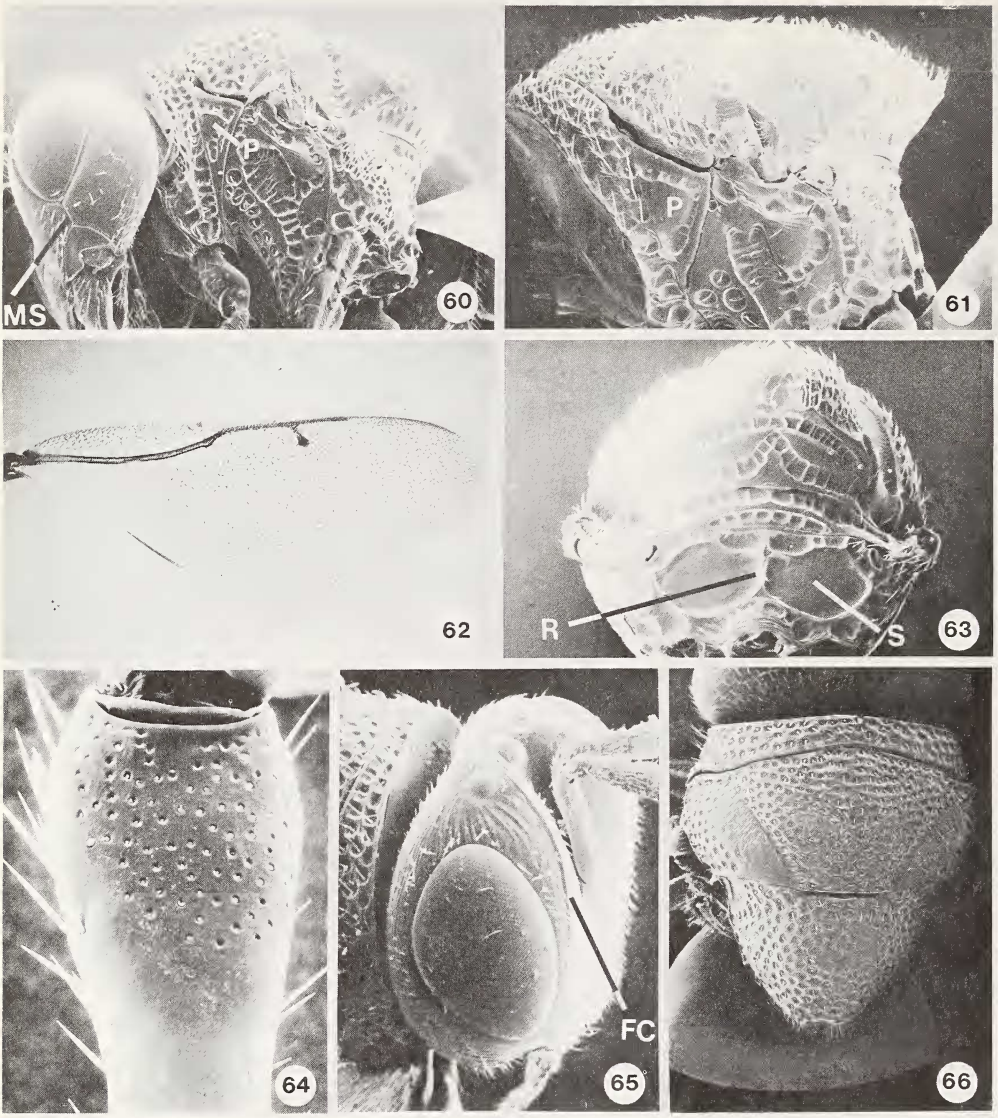
Figs. 33–40. 33–34. Mesosoma, *E. tanyglossa*. 33. Pronotum and mesoscutum, dorsal. 34. Scutellum, dorsal. 35–37. Mesosomata, lateral. 35. *E. tanyglossa*. 36. *E. krombeini*. 37. *E. triangularis*; 38. Head, frontal; *E. krombeini*. 39–40. Scutellum, underside. 39. *E. triangularis*. 40. *E. brasiliensis* [AX, axillula; MR, marginal rim of scutellum; P, postspiracular sclerite].



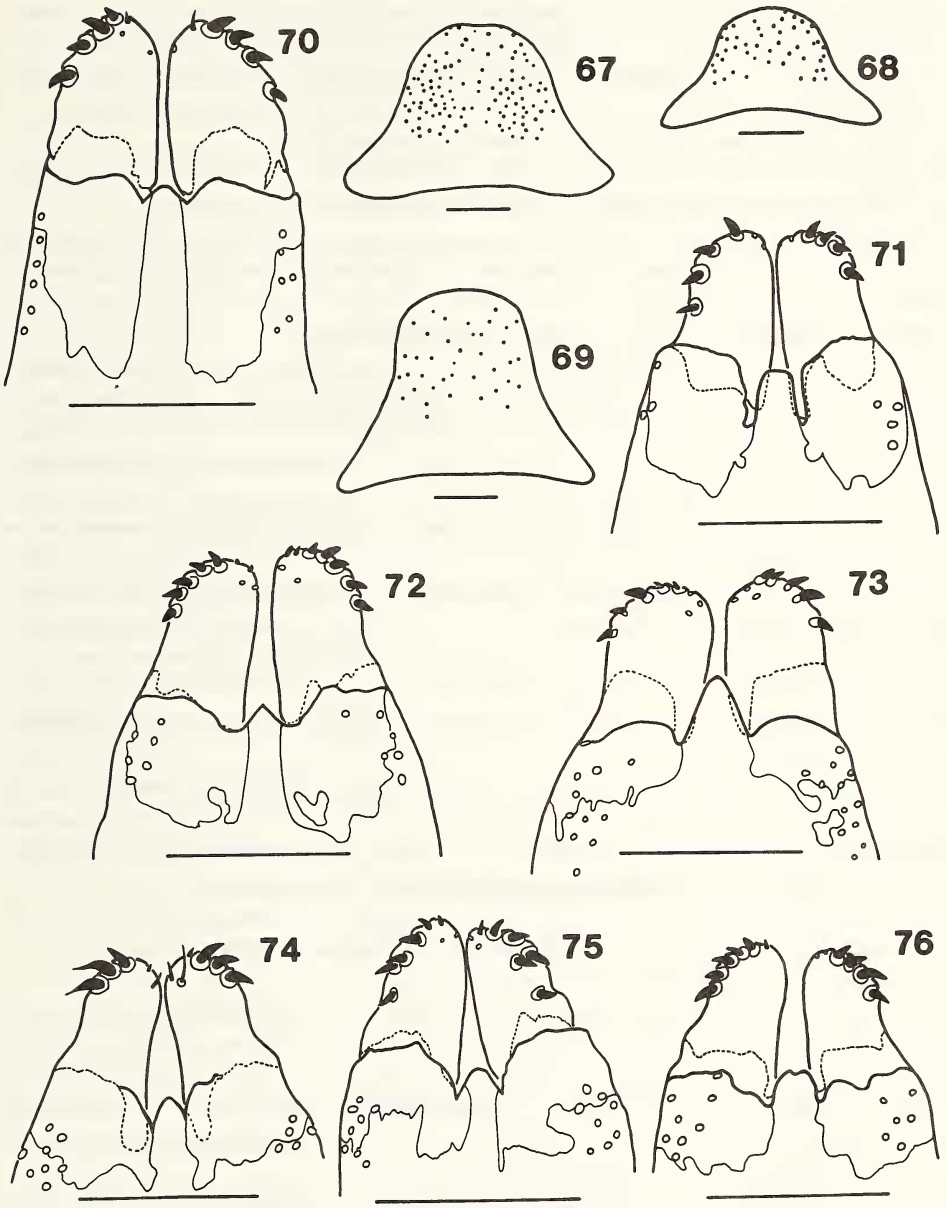
Figs. 41–52. Male antennal scapes. 41. *E. tanyglossa*, outer surface, 280x. 42–52. Anterior surfaces. 42. *E. tanyglossa*, 233x. 43. *E. krombeini*, 263x. 44. *E. triangularis*, 202x. 45. *E. luteicrus*, 233x. 46. *E. luteicrus*, 1,190x. 47. *E. solox*, 233x. 48. *E. solox*, 1,190x. 49. *E. brasiliensis*, 210x. 50. *E. enigma*, 233x. 51. *E. iodes*, 233x. 52. *E. iodes*, 1,190x.



Figs. 53–59. 53 - 54. [AL, axilla; AX, axillula]. 53. *E. triangularis*. 54. *E. brasiliensis*. 55–56. Labio-maxillary complexes [C, cardo, S, stipes and G, galea or galea/lacinia of maxilla; PR, prementum; L, ligula of labium]. 55. *E. triangularis*. 56. *E. tanyglossa*. 57 –59. Forewings. 57. *E. triangularis*. 58. *E. tanyglossa*. 59. *E. krombeini* [M, marginal, PM, postmarginal, S, stigmal and SM, submarginal veins].



Figs. 60–66. Character states in *Perilampus*. 60–61. Mesosomata, lateral. 60. *P. chysopae*. 61. *P. platygaster* [sic auct.]. 62. Forewing, *P. hyalinus*. 63. Propodeum, *P. platygaster*. 64. Male antennal scape, anterior surface, *P. hyalinus*. 65. Head, lateral, *P. hyalinus*. 66. Mesosoma, dorsal, *P. hyalinus* [FC, frontal carina; MS, malar sulcus; P, postspiracular sclerite; R, median ridge of propodeum; S, submedian area of propodium].



Figs. 67–76. Male genitalic structures of *Euperilampus*. 67–69. Subgenital plates. 67. *E. triangularis*. 68. *E. krombeini*. 69. *E. tanyglossa*. 70–76. Digiti and apex of basiparamere, ventral view (compare with Fig. 2). The demelanized areas of the basiparamere are outlined and compared with the stippled areas in Fig. 2. The lateral setae (Ls) are not drawn. Scale line 0.1 mm. 70. *E. tanyglossa*. 71. *E. luteicrus*. 72. *E. iodes*. 73. *E. krombeini*. 74. *E. enigma*. 75. *E. brasiliensis*. 76. *E. solox*.

PHYLOGENETIC RELATIONSHIPS

Hypotheses of phylogeny can be developed following the methods of Hennig (1966). Reference to an outgroup, ideally the sister group of the taxon under consideration, allows character states to be hypothesized as either plesiomorphic (ancestral) or apomorphic (derived). The degree of relationship, defined as the relative recency of common ancestry, can then be assessed based on shared derived characters (synapomorphies).

Character states and polarities are summarized in Table 2. The basis for the polarity decisions is outlined for the individual characters [ ] in the following discussion.

Intergeneric relationships within the Perilampidae are unresolved. All recognized genera show affinities with the speciose cosmopolitan genus *Perilampus* (Bouček 1978). It is quite possible that various species groups within *Perilampus* share a more recent common ancestor with other recognized genera than with other species of *Perilampus*.

A natural classification of the Perilampidae, i.e., one recognizing hypothesized phylogenetic relationships, must be based on recognition of monophyletic species groups within *Perilampus*. Smulyan (1936), in a revision of the nearctic species of *Perilampus*, recognized the 'carinate species group', based on possession of a distinct frontal carina (Fig. 65) *and* finger-like axillulae (Fig. 61). Both of these characters are here regarded as apomorphic in the Perilampidae. The frontal carina is absent from *Steffanolampus salicetum* (Steffan), and from species related to *Perilampus micans* Dalman [groups I regard as early derivatives of *Perilampus* on the basis of the structure of the postspiracular sclerite and labrum]. The frontal carina is also absent from widely divergent species of *Perilampus*. However, in addition to the New World species of *Perilampus*, the frontal carina is also developed in Indo-Pacific species related to *P. punctiventris* Crawford (e.g., *P. singaporensis* Rohwer, *P. nesiotes* Crawford), and in *Krombeinius* and *Euperilampus*. The frontal carina [1] is here regarded as a synapomorphy uniting these groups.

Albeit inappropriately named, Smulyan's 'carinate group' is regarded as monophyletic on the basis of the finger-like axillulae; this character is only found in the New World carinate species and is therefore regarded as apomorphic. This group is perhaps better referred to as the '*Perilampus hyalinus* group', based on the widespread New World species.

The *Perilampus hyalinus* group shares an apomorphic character with species of *Krombeinius* and *Euperilampus*: the malar sulcus is obliterated by oblique striation (costae) [2], as noted by Bouček (1978:302).

Krombeinius and *Euperilampus* are united on the basis of the following synapomorphies: postspiracular sclerite reduced to a narrow triangle [3]; pronotum massive dorsally [12]; inner orbits with well developed raised costae or rugae [13] (characters noted by Bouček 1978); and the propodeum lacking a distinct median ridge [14]. The plesiomorpic states are found in all species of *Perilampus*; however, the raised costae on the inner orbits are slightly developed in some species of the *Perilampus hyalinus* complex.

Euperilampus is defined on the basis of the following apomorphies: male genitalia with reduced parameres [8]; labrum 8-digitate [11]; marginal vein shorter than postmarginal [5]; scutellum with a distinct marginal rim [9]; and metasomal T3 transverse, shorter than T2 [10]. Autapomorphies have yet to be documented for *Krombeinius*. The strikingly modified labrum (see under discussion of genus *Euperilampus*, examined in a single specimen) and the host association (primary parasites of solitary wasps, known only for the type species, *K. eumenidarum*; host: *Paraleptomenes mephitis* (Cameron)) are possibly autapomorphies.

The preceding hypotheses of relationships allow polarity determinations for character states found in *Euperilampus*. A character state is regarded as plesiomorphic in *Euperilampus* if it is present in *Krombeinius*. If both character states are present in *Krombeinius* then the state of the character in the *P. hyalinus* group is considered as plesiomorphic. A cladogram can then be constructed to show the distribution of derived character states.

I have extended the cladistic analysis only to species groups of *Euperilampus*. The New World species groups are as outlined in the 'Synopsis', and three terminal taxa are used in the analysis: *E. krombeini*, *E. tanyglossa* group and *E. triangularis* group. No attempt was made to present a cladogram of *E. triangularis* group species. The diagnostic characters are mainly sculpture and color differences. I expect considerable homoplasy in these characters (convergences and reversals), and hence the resultant cladogram would be suspect. Old World species are represented in the analysis by *E. mediterraneus* Bouček, and *E. scutellatus* (Girault). I have examined a long series of specimens of *E. scutellatus* [USNM]. *E. mediterraneus* is well illustrated and described (Bouček 1972), and character states can be determined. *E. hymenopterae* (Risbec), *E. beharae* (Risbec), *E. sinensis* Bouček and *E. spina* Bouček are not included in the analysis; for the characters listed in Table 2 these species appear to be identical with *E. scutellatus*.

E. tanyglossa group (*E. tanyglossa*, *E. aureicornis*) (both from México) and *E. mediterraneus* (southern Bulgaria) constitute a monophyletic group on the basis of the following synapomorphies: labio-maxillary complex elongate [20]; and stigmal vein longer than marginal vein [7]. The labio-maxillary complex is elongated in a similar way in *E. mediterraneus* (Bouček 1972, Fig. 2) and in the E. tanyglossa group: the galea/lacinia of maxilla and prementum, and ligula of the labium are greatly lengthened. The maxillary palps are also elongate in all three species. These similarities in detail suggest that this elaboration is homologous, and occurred only once, in the common ancestor of the *E. tanyglossa* group and *E. mediterraneus*. In *E. krombeini*, the stigmal vein is subequal in length to the marginal vein [6] (Fig. 59). This character state is phenotypically intermediate between the plesiomorphic and apomorphic states of character 7. I do not regard this as a linear transformation series or morphocline (stigmal vein shorter than marginal, stigmal vein equal to marginal, stigmal vein longer than marginal vein) on the basis of other characters. Seven synapomorphies indicate that *E. krombeini* and *E. mediterraneus* + *tanyglossa* group are not sister groups [4,15,17,22,18]. Only two characters support a sister group relationship between these taxa, and these are color characters [19,21], and are discussed later as convergences.

The long-tongued species of *Euperilampus* are united with *E. scutellatus* by the following characters: notauli indistinctly indicated [18]; and the mesoscutum uniformly sculptured, without a more weakly sculptured area along the notauli [22]. The alternative character states (see Table 2) are found in *Krombeinius* and *Perilampus* and therefore considered plesiomorphic for *Euperilampus*.

E..triangularis group and *E. krombeini* are united by the presence of cross-arcuate rugae or costae on the mesoscutum [17]; the deep median foveae on the propodeum [15]; and the postspiracular sclerite abruptly narrowed ventrally [4].

Figure 77 is the most parsimonious cladogram based on the characters in Table 2. This analysis is not free of homoplasy. Metallic colors [19] and infuscate wings [21] appear to have arisen convergently in the two lineages of *Euperilampus*. It is interesting to note that all New World species have metallic colors and all Old World species are dark black. There is also a reversal indicated by this analysis. The raised costae on the inner orbits [13] are reduced in *E.*

Table 2: Polarity of character states in *Euperilampus* and related genera, based on outgroup comparisons (see text for discussion).

No.	Attribute	Plesiomorphic State	Apomorphic State
1	Frontal carina	absent	present (Fig. 65)
2	Malar sulcus	distinct (Fig. 60)	obliterated by oblique costae (Fig. 9)
3	Width of postspiracular sclerite	as broad as adjacent pronotum (Figs. 60, 61)	reduced to narrow triangle, less than one-half as wide as the adjacent pronotum (Figs. 35-37)
4	Shape of postspiracular sclerite	gradually narrowed ventrally, not sinuous (Fig. 35)	abruptly narrowed ventrally, sinuous (Figs. 36, 37)
5	Marginal vein, forewing	longer than postmarginal (Fig. 62)	much shorter than postmarginal (Figs. 57-59)
6	Stigmal vein, forewing	much shorter than marginal (Fig. 57)	subequal to marginal (Fig. 59)
7	Stigmal vein, forewing	much shorter than marginal (Fig. 57)	longer than marginal (Fig. 58)
8	Parameres, male genitalia	distinct	reduced (Fig. 2)
9	Marginal rim of scutellum	absent (Fig. 66)	present (Fig. 34)
10	Metasoma, tergite 3	quadrate, much longer than T2	transverse, wider than long, shorter than T2
11	Labrum	10, 12 digitate	8 digitate (Fig. 3)
12	Pronotum, size	narrowed dorsally, much less than one-third length mesoscutum (Fig. 66)	massive, one-third to one-half length mesoscutum (Figs. 13-16)
13	Inner orbit sculpture	smooth or impunctate	with distinctly raised costae or rugae (Figs. 9-11)
14	Propodeum, sculpture	median area with distinct raised ridge (Fig. 63)	median area with foveae (Figs. 17-20)
15	Propodeum, sculpture	median area broad, with weak foveae, submedian areas not distinctly delimited (Fig. 18)	median area with distinct, deep foveae (Figs. 17,19,20)
16	Outer orbits	merge smoothly with face (Fig. 8)	merge abruptly with face (Fig. 9)
17	Mesoscutum, sculpture	punctate-reticulate (Fig. 33)	cross-arcuate rugae or costae (Fig. 14)
18	Notauli	distinct (Fig. 14)	indistinct (Fig. 33)

(continued on next page)

Table 2 (continued)

No.	Attribute	Plesiomorphic state	Apomorphic state
19	Color	black	metallic vi2let to green
20	Labio-maxillary complex	short (Fig. 55)	elongate (Fig. 56)
21	Wing pigmentation	hyaline (Fig. 62)	infuscate (Fig. 57-59)
22	Mesoscutum, sculpture	with slightly sculptured areas on the sidelobe (Fig. 14, 66)	evenly sculptured throughout (Fig. 33)

krombeini.

This preliminary analysis documents the monophyly of *E. tanyglossa* + *aureicornis* + *mediterraneus*; this relationship cannot be retrieved from a classification recognizing the subgenera *Euperilampus* (New World) and *Euperilampoides* (Old World). Further phylogenetic studies will be required for the placement of the remaining Old World species and should serve to test the present cladogram.

If the above hypothesized relationships of the *Perilampus hyalinus* group, *Krombeinius* and *Euperilampus* are corroborated by the placement of additional species, by additional characters, and the elucidatioon of monophyletic species groups within *Perilampus*, then the recognition of these two genera would render *Perilampus* paraphyletic. The genus would not include all species descended from a common ancestor. Species would be placed in *Perilampus* if they belonged to the Perilampidae but lacked the autapomorphies of the other genera. In the final analysis it may be prudent to retain *Krombeinius* and *Euperilampus* and to describe new genera, where needed, for monophyletic species groups of *Perilampus*. Clearly, the first priority for the development of a natural classification of the Perilampidae is the definition of monophyletic species groups within the core genus, *Perilampus*.

ACKNOWLEDGEMENTS

I thank the following for comments on the manuscript: Z. Bouček, W. L. Brown, Jr., L. Burnham, J. M. Carpenter, G. C. Eickwort, G. A. P. Gibson, E. E. Grissell, N. F. Johnson, S. Nichols, M. J. Sharkey, M. Schauff, Q. D. Wheeler, and C. M. Yoshimoto.

The frontispiece was skillfully prepared by Jim Miller. Figures 10, 13, 15, 23, 24 and 31 were prepared from scanning electron micrographs of uncoated specimens; I thank H. F. Howden and L. E. C. Ling of Carleton University, Ottawa for these photographs.

This research was supported in part by a National Science Foundation Dissertation Improvement Grant. The Griswold Fund Committee, Department of Entomology, Cornell University assisted with the publication costs.

Special thanks are extended to Dr. J. G. Franclemont, for numerous discussions of all aspects of the project.

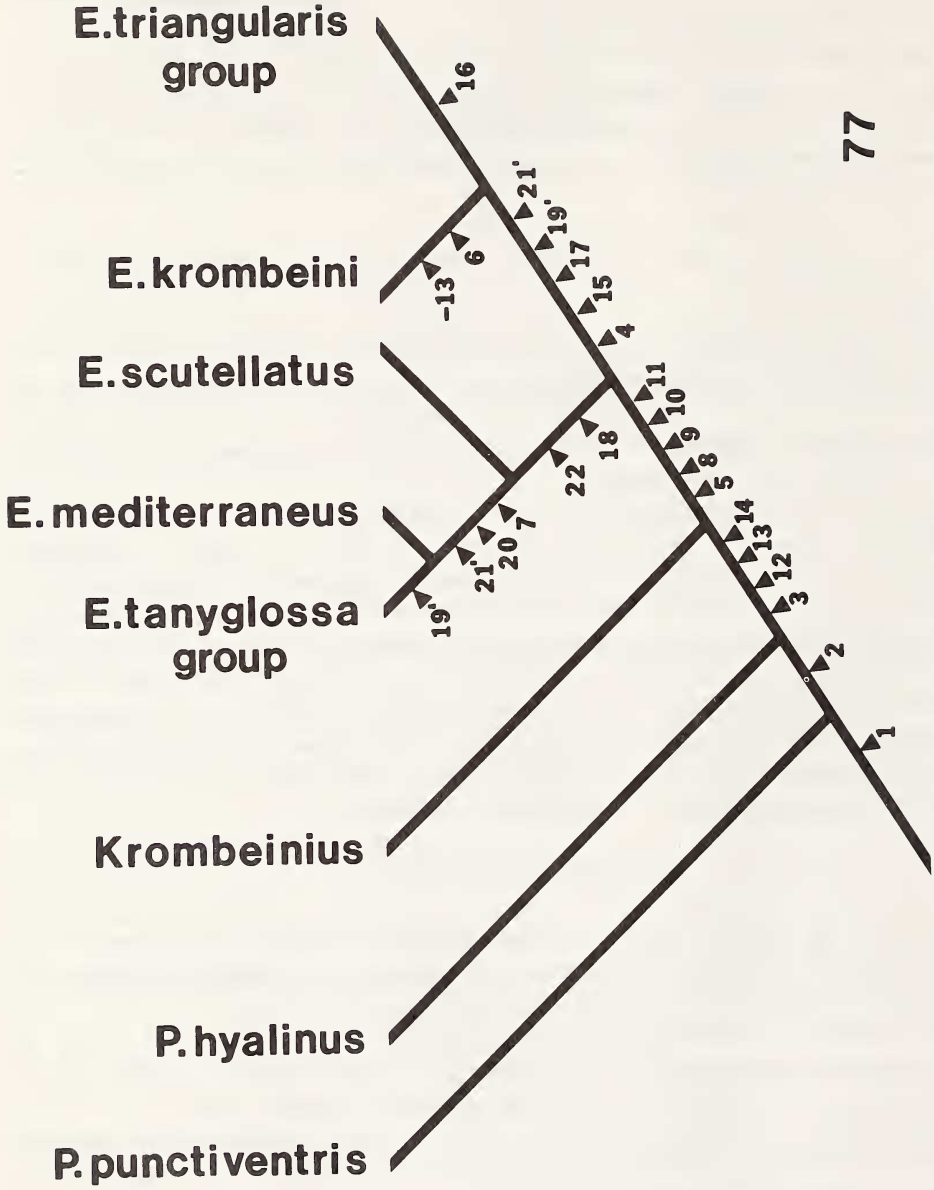


Fig. 77. Cladogram showing the distribution of shared derived characters (synapomorphies) in genera of Perilampidae and in species and species groups of *Euperilampus* (see text for discussion of species groups). x = synapomorphy, x' = convergence, -x = reversal. Autapomorphies of the terminal taxa are not presented. Characters are defined in Table 2.

LITERATURE CITED

Ashmead, W.H. 1890. On the Hymenoptera of Colorado. Bulletin of the Colorado Biological Association, 1. 46 pp.

Ashmead, W.H. 1904. Classification of the Chalcid flies, or the Superfamily Chalcidoidea with descriptions of new species in the Carnegie Museum, collected in South America by Herbert H. Smith. Memoirs of the Carnegie Museum 1(4): 225–251.

Askew, R. R. 1980 (1979). The biology and larval morphology of *Chrysolampus thenae* (Walker) (Hym., Pteromalidae). The Entomologist's Monthly Magazine, 115: 155–159.

Bouček, Z. 1972. Mediterranean Perilampinae: *Euperilampus* and genera allied to *Chrysomalla*. Mitteilungen der Münchener entomologischen Gesellschaft, 61: 90–107.

Bouček, Z. 1978. A generic key to Perilampinae (Hymenoptera, Chalcidoidea), with a revision of *Krombeinius* n. gen. and *Euperilampus* Walker. Entomologica scandinavica 9: 299–307.

Bouček, Z. 1980. A revision of the genus *Monacon* Waterston (Hymenoptera: Chalcidoidea: Perilampinae), parasites of ambrosia beetles (Coleoptera: Platypodidae). Bulletin of Entomological Research, 70: 73–96.

Burks, B.D. 1969. New Perilampidae (Hymenoptera: Chalcidoidea). Proceedings of the Entomological Society of Washington, 71: 73–81.

Burks, B.D. 1979. Family Pteromalidae, p. 768–835. *In*: Krombein, K.V., Hurd, P.D. Jr., Smith, D.R. and B.D. Burks. Catalog of Hymenoptera in America North of Mexico, Volume 1. Smithsonian Institution Press, Washington, D.C. 1198 pp.

Clancy, D.W. 1946. The insect parasites of the Chrysopidae (Neuroptera). University of California Publications in Entomology, 7: 403–496.

Crawford, J.C. 1914. The species of Perilampidae of America north of Mexico. Proceedings of the Entomological Society of Washington, 16: 69–76.

Domenichini, G. 1953. Studio sulla morfologia dell'addome degli Hymenoptera Chalcidoidea. Bollettino di Zoologia Agraria e Bachicoltura, 19: 183–298, 27 Figs.

Domenichini, G. 1969. Materiali per la morfologia comparata degli Hymenoptera Chalcidoidea. Memorie della Società Entomologica Italiana, 48: 584–608, 53 Figs.

Eady, R.D. 1968. Some illustrations of microsculpture in the Hymenoptera. Proceedings of the Royal Entomological Society of London, (A): 43: 66–72, 31 Figs.

Fidalgo, A.P. 1980. Neuvas citas de calcidoideos para Argentina, Bolivia y Peru (Hymenoptera). Neotropica, 26: 193–196.

Fox, D.L. 1979. Biochromy. University of California Press, Berkeley. 248 pp.

Girault, A.A. 1915. Australian Hymenoptera Chalcidoidea - V. Supplement. Memoirs of the Queensland Museum, 3: 300–312.

Graham, M.W.R. de V. 1969. The Pteromalidae of north-western Europe (Hymenoptera: Chalcidoidea). Bulletin of the British Museum (Natural History) Entomology Supplement 16. 908 pp.

Harris, R.A. 1979. A glossary of surface sculpturing. Occasional Papers in Entomology, State of California, Department of Food and Agriculture, No. 28. 31 pp.

Hennig, W. 1966. Phylogenetic Systematics. University of Illinois Press, Urbana, IL. 263 pp.

Holland, W.J. 1919. Herbert Huntington Smith. Science, 49: 481–483.

Parker, H.–L. 1924. Recherches sur les formes postembryonnaires des chalcidiens. Annales de la Société Entomologique de France, 93: 261–379.

Peck, O. 1951. Superfamily Chalcidoidea, p. 410-594. *In:* Muesebeck, C.F.W., K.V. Krombein and H.K. Townes. Hymenoptera of America North of Mexico. Synoptic Catalog. U.S. Dept. Agr. Monogr. No. 2. 1420 pp.

Peck, O. 1963. A catalogue of the Nearctic Chalcidoidea (Insecta: Hymenoptera). The Canadian Entomologist, Supplement 30. 1092 pp.

Principi, M.M. 1947. Contributi allo studio dei Neurotteri Italiana V. Richerche su *Chrysopa formosa* Brauer e su alcuni suoi parassiti. Bollettino dell'Istituto di Entomologia della Università delgi studi di Bologna, 16: 134–175.

Richards, O.W. 1977. Hynenoptera, Introduction and key to families, Second Edition. Royal Entomological Society of London, London. 100 pp.

Riek, E. F. 1966. Australian Hymenoptera Chalcidoidea, Family Pteromalidae, Subfamily Perilampinae. The Australian Journal of Zoology, 14: 1207–1236.

Rohwer, S.A. 1923. New Hymenoptera from the Malayan Region. The Philippines Journal of Science, 22: 345–353.

Say, T. 1828. Descriptions of new species of Hymenoptera of the United States. Contributions of the Maclurian Lyceum of the Arts and Sciences, 1: 67–83.

Smith, H.S. 1912. Technical results from the gypsy moth parasite laboratory. IV. The chalcidoid genus *Perilampus* and its relation to the problem of parasite introduction. United States Bureau of Entomology, Technical Series 19(4): 33–68.

Smulyan, M.T. 1936. A revision of the chalcid flies of the genus *Perilampus* Latreille occurring in America north of Mexico. Proceedings of the United States National Museum, 83: 369–412.

Walker, F. 1862. Notes on Chalcidites, and characterization of undescribed species. Transactions of the Entomological Society of London, (3)1: 345–397.

Walker, F. 1871. Notes on Chalcidiae, Part IV. Chalcididae, Leucospidae, Agaonidae, Eucharidae, Perilampidae, Ormyridae, Eurytomidae. E. W. Janson, London. 129 pp.

Warren, L.O. and M. Tadic. 1970. The fall webworm, *Hyphantria cunea* (Drury). University of Arkansas Agricultural Experiment Station Bulletin, 759. 106 pp.